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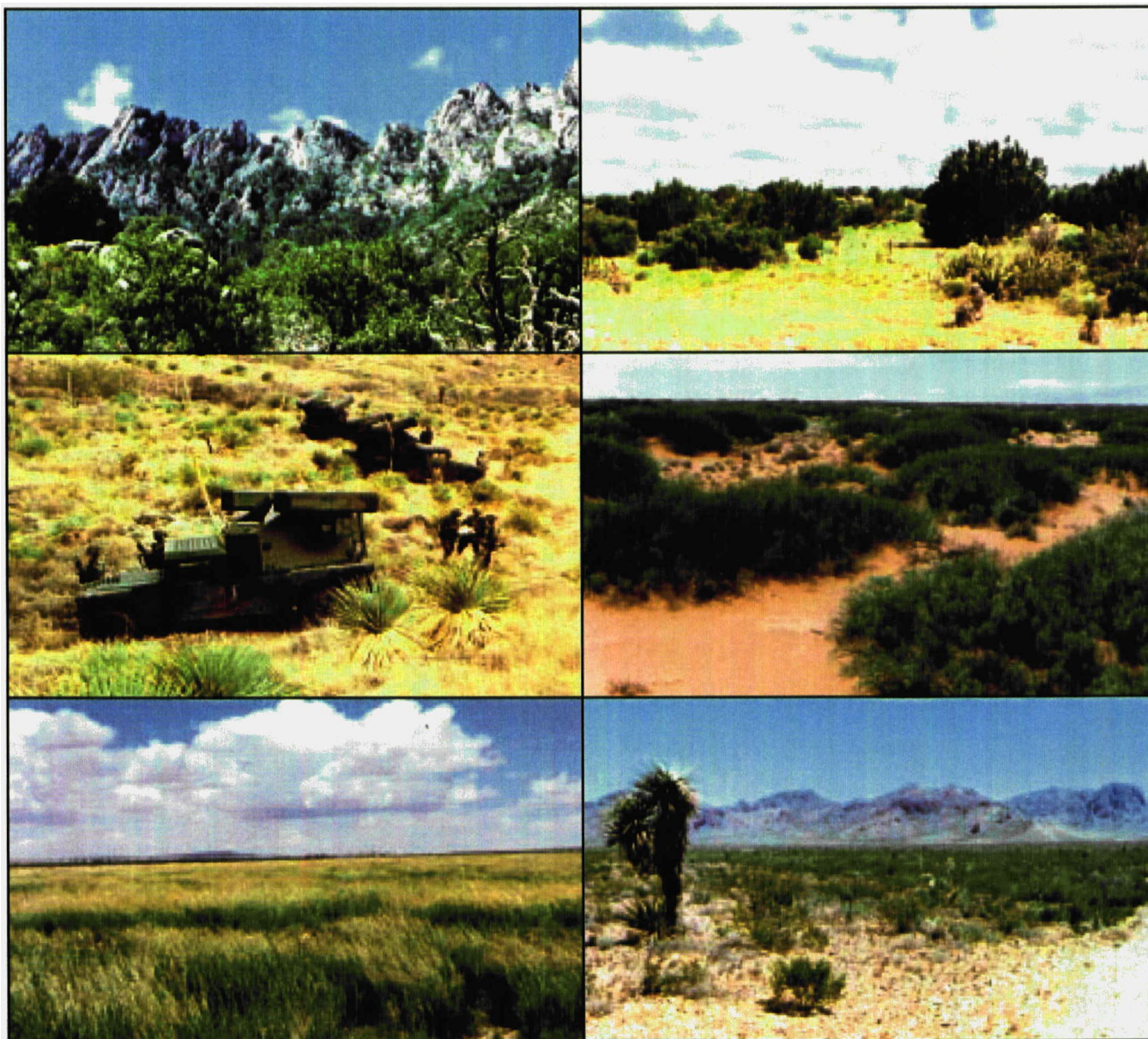
Natural Resources
Conservation
Service

in cooperation with
United States Department
of Defense, Fort Bliss
Military Reservation

United States Department
of the Interior, Bureau of
Land Management

The New Mexico
Agricultural Experiment
Station and
the Texas Agricultural
Experiment Station

Soil Survey of Fort Bliss Military Reservation, New Mexico and Texas



How to Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

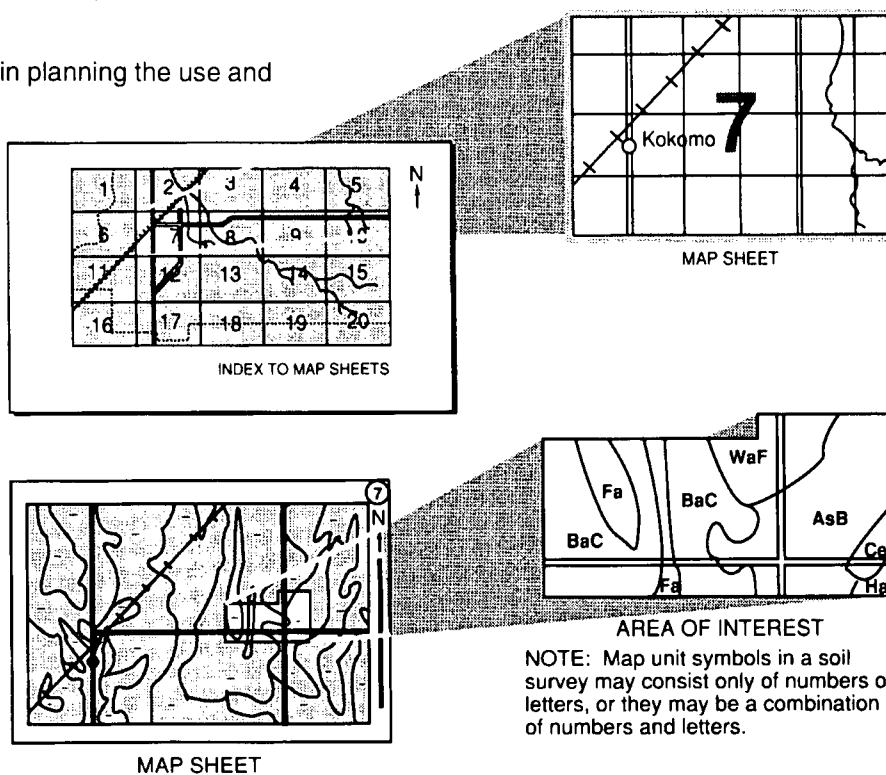
Detailed Soil Maps

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.



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 2000. Soil names and descriptions were approved in 2000. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2000. This survey was made cooperatively by the Natural Resources Conservation Service and the United States Department of Defense, Fort Bliss Military Reservation; the Department of the Interior, Bureau of Land Management; and the New Mexico Agricultural Experiment Station and Texas Agriculture Experiment Station. The survey is part of the technical assistance furnished to the La Union Soil and Water Conservation District, the Otero Soil and Water Conservation District, and the El Paso-Hudspeth Soil and Water Conservation District.

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: Fort Bliss Military Reservation encompasses a wide array of landforms and a diversity of soils and vegetation. Clockwise, from top left:

A: At the highest elevations, Aguja-Rock outcrop complex, 35 to 65 percent slopes, makes up the picturesque Organ Mountains. This area is used mainly as wildlife habitat.

B: At slightly lower elevations are areas of savannah. This is an area of Deama-Penalto-Rock outcrop complex, 5 to 15 percent slopes, in the southern Sacramento Mountains. This area is used for livestock grazing and wildlife habitat.

C: At the lowest elevations large areas are covered by shrub-coppice dunes. This area of Copia-Patriot complex, 2 to 5 percent slopes, is an example of such an area.

D: Large fan piedmonts occur at the base of mountains. This area of Missile very gravelly fine sandy loam, 3 to 15 percent slopes, is on a fan piedmont.

E: At the intermediate elevations are large areas of mixed prairie. This area of Reyab loam, 0 to 1 percent slopes, ponded, has a thick stand of alkali sacaton.

F: One of the many vital military operations that occur each year on Fort Bliss Military Reservation.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is <http://www.nrcs.usda.gov>.

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Foreword

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.

Rosendo Trevino III
State Conservationist
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Soil Survey of Fort Bliss Military Reservation, New Mexico and Texas

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
United States Department of Defense, Fort Bliss Military Reservation; the Department of the Interior, Bureau of Land Management; the New Mexico Agricultural Experiment Station; and Texas Agriculture Experiment Station. It is part of the technical assistance furnished to the La Union Soil and Water Conservation District, the Otero Soil and Water Conservation District, and the El Paso-Hudspeth Soil and Water Conservation District.

Introduction

This soil survey updates parts of the surveys of El Paso County, Texas, Dona Ana County, New Mexico, and Otero Area, New Mexico—Parts of Otero, Eddy, and Chavez Counties published in 1971, 1980, and 1981 respectively. It provides additional information and has larger-scale maps, which show the soils in greater detail.

Fort Bliss Military Reservation is located in west Texas and south central New Mexico (fig. 1). The survey area covers 1,099,514 acres or 1,718 square miles and includes portions of El Paso County, Texas, and Dona Ana and Otero Counties in New Mexico. The main post is located within the city of El Paso, Texas, and is bordered on the northeast by the Lincoln National Forest and the Hueco Mountains to the southeast. To the west, the Franklin Mountains in Texas; the Organ Mountains in New Mexico; and to the northwest, the White Sands Missile Range make up the border of Fort Bliss.

The survey area contains various landforms, including the Tularosa Basin, Otero Mesa, and the mountain ranges that border Fort Bliss. Mountains atop Otero Mesa begin at 5,500 ft and rise to 7,500 ft.

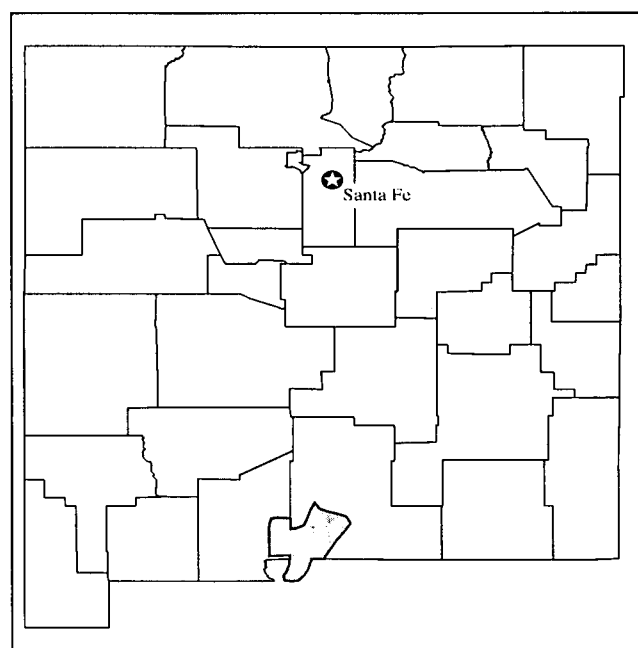


Fig. 1.—Location of Fort Bliss Military Reservation in Texas and New Mexico.

Mountains in the basin begin at 4,500 ft. and climb to 8,000 ft. Fort Bliss is managed jointly by the United States Army and the Bureau of Land Management. This survey was mapped at a scale of 1:24,000.

History of the Tularosa Basin and Fort Bliss

The Tularosa Basin lies between the San Andreas and Sacramento Mountains. At its widest, the basin is about 60 miles wide and 150 miles long. The basin has no external drainage. Any water generated from the surrounding mountains accumulates in the playas found on the basin floor.

At the end of the last ice age, about 10,000 years ago, the climate was much different than it is today. A cooler, wetter period existed, and this led to the formation of a large lake known as Lake Lucero. Today it is called Lake Otero, and although it once covered several hundred square miles, it is now mostly a dry playa and alkali flat.

During the end of the ice age, Paleo-Indian hunters utilized the area. Evidence of their passage includes fluted points and charcoal debris from cooking fires. Other Indians hunted and lived within the basin and surrounding mountains, even as the climate began to become warmer and dryer. By the period known as Pueblo II (950-1100 A.D.), above-ground settlements were forming. Two pueblos in the area include the Alamo Mountain site and Escondida. Other nomadic Indians continued to use a hunting and gathering strategy across the basin floor.

The first Europeans reached the site of El Paso in 1581. A Franciscan lay brother, Agustin Rodriguez, and a military captain, Francisco Sanchez Chamuscado, led a small party up the Rio Grande. Don Juan de Onate established a colony at this site in 1598, officially naming it El Paso del Norte. The Sacramento and San Andres Mountains had become the home and hunting areas for Apache Indians. Some conflicts between the Spanish and Apaches occurred along the Camino Real.

In 1680, the Pueblo Revolt drove the Spanish out of northern New Mexico. The Tigua Indians, who were allies with the Spanish, retreated along with their allies to El Paso del Norte. The Tiguas established a village at Ysleta del Sur.

Repeated raids by Apache Indians led to the establishment of a Spanish military garrison in the vicinity of San Elizario. As Spanish populations continued to increase, their communities expanded. In 1827, Juan Maria Ponce de Leon built a hacienda in what is now downtown El Paso.

Texas declared itself a Republic in 1839 after

fighting a war with Mexico and defeating the army led by Santa Ana. The Texas issue led to increased tension between the United States and Mexico, and after a border clash along the Rio Grande on May 13, 1846, the Congress declared war on Mexico. The war continued until 1848 when the Treaty of Guadalupe Hidalgo was signed. The United States established a permanent army post in El Paso on November 7, 1848. The purpose of the post was to provide protection against Indian raids.

In December 1853, the 8th infantry established the Military Post of El Paso. On March 8, 1854, the post was renamed Fort Bliss in honor of William Wallace Smith Bliss, an army veteran. Fort Bliss was continually occupied until the Civil War. The mission of the post included defense against hostile Indians and protection of the Butterfield Stage Line, which arrived in 1858. With the coming war, the officers began to ally themselves with either the United States or the Confederacy. James Longstreet and George Pickett became generals in the Confederate Army, gaining notoriety in the battles of Antietam and Gettysburg respectively. On March 31, 1861, Major General Twiggs, Commander of the Department of Texas, surrendered all Texas posts, including Fort Bliss, to the Confederacy. Fort Bliss was the headquarters for the Confederate forces until they were driven out by Union forces under Colonel Carleton. During the Confederate retreat, the post was burned and not reoccupied until the end of the war.

Fort Bliss was reoccupied by the U.S. Army on October 16, 1865. Indian attacks had decimated the population of El Paso, leaving 23 Americans and 150 Mexicans. The post was relocated in response to a shift of the Rio Grande, and its name was changed to Camp Concordia. The reoccupation led the Indian tribes to move away from the post, towards the north. In 1876, most of the troops were moved north to fight the Indians, and the remaining troops were sent to Fort Davis. Camp Concordia was abandoned from 1877 until 1878, when civil unrest caused the army once again to garrison troops in El Paso.

Flooding along the Rio Grande in 1862 pushed Mexican farming families to settle the town of Tularosa. Apache Indians attacked the settlers, attempting to drive them back towards Las Cruces, as had happened with earlier settlements. By 1874, the Three Rivers cattle operation began to operate from the Sacramento Mountains. Texas cattlemen began to enter the basin during the 1880's. Most ranches were headquartered in the Sacramento and San Andres Mountains and grazed both the basin and the forested lands.

The town of Alamogordo was platted in 1898, and

soon a railroad line passed through the Tularosa Basin from Vaughn to El Paso. Oliver Lee and a group of El Paso businessmen formed the Circle Cross Ranch in 1914. The ranch controlled over a million acres from the Mescalero Indian Reservation to Ysleta, Texas. The ranch was broken up around 1926.

Fort Bliss was moved to its current location in 1893. The post sent troops to Columbus, New Mexico, in 1916 after the Pancho Villa raid. When World War I came, Fort Bliss was garrisoned by a Provisional Cavalry Division and became a training ground for troops bound for Europe. After World War I ended, Fort Bliss was used for border defense. Biggs Airfield was added in 1926.

Fort Bliss continued to grow. It was used as a training center for anti-aircraft weapons during World War II. With the advent of jet engines, Fort Bliss began to work with air defense missiles. The size of the testing ranges was increased from 1948 to 1951, and the military expanded into more public and private lands. McGregor Range was added to the base in 1954. Today the military mission is the primary use for the lands of the Tularosa Basin and Fort Bliss.

Climate

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

Climate tables were created from climate station Orogrande 1 N, New Mexico.

Thunderstorm days, relative humidity, percent sunshine, and wind information were estimated from First Order station El Paso, Texas.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Orogrande in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 43.6 degrees F, and the average daily minimum temperature is 28.1 degrees. The lowest temperature on record, which occurred at Orogrande on January 11, 1962, was -13 degrees. In summer, the average temperature is 78.9 degrees and the average daily maximum temperature is 94.6 degrees. The highest temperature, which occurred at Orogrande on September 7, 1948, was 112 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive

plantings of a crop between the last freeze in spring and the first freeze in fall.

Average annual precipitation over this survey area ranges from slightly less than 10 inches in western sections to more than 16 inches along the northern boundary. Most of the eastern portion of the Reservation receives between 13 and 15 inches of annual precipitation. The average annual total precipitation in Orogrande is 11.13 inches. Of this, about 8.9 inches, or 80 percent, usually falls in April through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 3.08 inches at Orogrande on August 2, 1999. Thunderstorms occur on about 36 days each year, and most occur in July and August.

The average seasonal snowfall at Orogrande is 4.5 inches, but it is estimated that average annual snowfall in the northern boundary section of the Reservation is near 10 inches. The greatest snow depth at any one time during the period of record at Orogrande was 7 inches, recorded on February 9, 1980. On an average, 2 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record at Orogrande was 8 inches, recorded on January 13, 1985.

The average relative humidity in mid-afternoon is about 27 percent. Humidity is higher at night, and the average at dawn is about 57 percent. The sun shines 84 percent of the time in summer and 77 percent in winter. The prevailing wind is from the north during October to February, from the west during the spring (March to May), and from the south from June to September. Average wind speed is highest, around 12 miles per hour, in March and April.

How This Survey Was Made

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

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

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

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

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the

soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

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

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

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

Survey Procedures

The general procedures followed in making this survey are described in the National Soil Survey Handbook of the Natural Resources Conservation Service (USDA, 1996) and the Soil Survey Manual (USDA, 1993). Published soil surveys from Otero and Dona Ana counties, New Mexico, and El Paso County, Texas, and the maps "Geology Of East Half Of Las Cruces And Northeast El Paso" and the "Geologic Atlas Of Texas, Van Horn, El Paso Sheet" were among the references used.

The Fort Bliss Military Reservation Soil Survey is an update for portions of Otero and Dona Ana Counties, New Mexico, and El Paso County, Texas. The previous soil surveys were mapped at scales ranging from 1:31,680 to 1:63,360. Some of the established soil series used in these adjoining surveys were used

for the Fort Bliss Military Reservation survey. The three soil surveys were used as a preliminary reference of soil map units and soil series.

Before the fieldwork began, preliminary boundaries of slopes and landforms were plotted stereoscopically on 1:24,000 scale aerial photographs taken in 1996. Soil scientists studied U.S. Geological Survey topographic maps, at a scale of 1:24,000, to relate land and image features. Reconnaissance was made by vehicle before the landscape was traversed on foot.

Sample areas were selected to represent the major landscapes in the survey area. These areas were investigated more closely than the rest of Fort Bliss Military Reservation. Extensive notes were taken on the composition of map units in these preliminary study areas. As mapping progressed, these preliminary notes were modified and a final assessment of the composition of the individual map units was made.

As traverses were made, the soil scientists divided

the landscape into landforms or landform segments based on use and management of the soils. For example, a hill would be separated from a depression, and a gently sloping summit would be separated from a very steep back slope of a ridge. In most areas, soil examinations along the traverses were made from 50 to 500 feet apart, depending on the landscape and soil pattern.

Observations of such items as landform, arroyo banks, vegetation, animal burrows, roadcuts, and trenches made by previous military activity were made without regard to spacing. Soil boundaries were determined on the basis of soil examinations, observations, and photo interpretation. The soil material was examined with the aid of a hand auger or a spade to a depth of about 6 feet or to bedrock within a depth of 6 feet. The pedons described as typical were observed and studied in pits that were dug with shovels, spades, or backhoes.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil descriptions

Soils on Basin Floors

The map units in this group make up about 43 percent of the survey area. The mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. Elevation is 3,900 to 4,200 feet. These soils are used mainly for wildlife habitat.

1. Copia-Mcnew-Elizario Association

Gently sloping, well drained and excessively drained, very deep soils on alluvial flats and dunes on basin floors.

Setting

Landform: Basin floor
Slope range: 2 to 5 percent

Composition

Extent of the association:
22 percent of the survey area

Copia and similar soils: 33 percent
Mcnew and similar soils: 30 percent
Elizario and similar soils: 8 percent
Minor soils: 29 percent

Soil Properties and Qualities

Copia

Depth class: Very deep
Drainage class: Excessively drained
Landform: Dune on basin floor
Parent material: Eolian sand
Surface textural class: Loamy fine sand
Slope: Gently sloping

Mcnew

Depth class: Very deep
Drainage class: Well drained
Landform: Alluvial flat on basin floor
Parent material: Eolian sand over alluvium
Surface textural class: Sandy loam
Slope: Gently sloping

Elizario

Depth class: Very deep
Drainage class: Well drained
Landform: Alluvial flat on basin floor
Parent material: Alluvium
Surface textural class: Sand
Slope: Gently sloping

Minor Soils

Foxtrot and Patriot soils on alluvial flats on basin floors
Pendero soils on sand sheets on basin floors

2. Pendero-Copia-Piquin Association

Gently sloping to strongly sloping, somewhat excessively drained and excessively drained, very deep soils on sand sheets, dunes, and relict terraces on basin floors.

Setting

Landform: Basin floor
Slope range: 2 to 15 percent

Composition

Extent of the association:

6 percent of the survey area

Pendero and similar soils: 46 percent

Copia and similar soils: 37 percent

Piquin and similar soils: 12 percent

Minor soils: 5 percent

Soil Properties and Qualities

Pendero

Depth class: Very deep

Drainage class: Somewhat excessively drained

Landform: Sand sheet on basin floor

Parent material: Eolian sand

Surface textural class: Loamy fine sand

Slope: Gently sloping

Copia

Depth class: Very deep

Drainage class: Excessively drained

Landform: Dune on basin floor

Parent material: Eolian sand

Surface textural class: Loamy fine sand

Slope: Gently sloping

Piquin

Depth class: Very deep

Drainage class: Somewhat excessively drained

Landform: Relict terrace on basin floor

Parent material: Alluvium

Surface textural class: Very gravelly sandy loam

Slope: Strongly sloping

Minor Soils

Yippin soils on erosion remnants on fan piedmonts

3. Copia-Nations-Hueco Association

Nearly level to gently sloping, excessively drained and well drained, moderately deep and very deep soils on alluvial flats and dunes on basin floors.

Setting

Landform: Basin floor

Slope range: 0 to 5 percent

Composition

Extent of the association:

15 percent of the survey area

Copia and similar soils: 49 percent

Nations and similar soils: 25 percent

Hueco and similar soils: 17 percent

Minor soils: 9 percent

Soil Properties and Qualities

Copia

Depth class: Very deep

Drainage class: Excessively drained

Landform: Dune on basin floor

Parent material: Eolian sand

Surface textural class: Loamy fine sand

Slope: Gently sloping

Nations

Depth class: Moderately deep

Drainage class: Well drained

Landform: Alluvial flat on basin floor

Parent material: Eolian sand over alluvium

Surface textural class: Loamy fine sand

Slope: Nearly level

Hueco

Depth class: Moderately deep

Drainage class: Well drained

Landform: Basin floor

Parent material: Eolian sand

Surface textural class: Loamy fine sand

Slope: Nearly level

Minor Soils

Foxtrot soils on alluvial flats on basin floors

Soils on Fan Piedmonts

The map units in this group make up about 34 percent of the survey area. The mean annual precipitation is about 12 inches, and the mean annual temperature is about 61 degrees F. Elevation is 4,200 to 6,000 feet. These soils are used mainly for livestock grazing and wildlife habitat.

4. Reyab-Infantry-Crossen Association

Nearly level to strongly sloping, well drained, very shallow, shallow, and very deep soils on inset fans and erosion remnants on fan piedmonts.

Setting

Landform: Fan piedmont

Slope range: 0 to 10 percent

Composition*Extent of the association:*

20 percent of the survey area

Reyab and similar soils: 43 percent

Infantry and similar soils: 23 percent

Crossen and similar soils: 10 percent

Minor soils: 24 percent

Soil Properties and Qualities**Reyab**

Depth class: Very deep

Drainage class: Well drained

Landform: Inset fan on fan piedmont

Parent material: Alluvium

Surface textural class: Silt loam

Slope: Nearly level

Infantry

Depth class: Very shallow and shallow

Drainage class: Well drained

Landform: Erosion remnant on fan piedmont

Parent material: Alluvium

Surface textural class: Very gravelly loam

Slope: Gently sloping to strongly sloping

Crossen

Depth class: Very shallow and shallow

Drainage class: Well drained

Landform: Fan remnant on fan piedmont

Parent material: Alluvium

Surface textural class: Gravelly fine sandy loam

Slope: Gently sloping

Minor Soils

Mariola soils on erosion remnants on fan piedmonts

Sonic soils on inset fans on fan piedmonts

5. Jerag-Reyab-Armesa Association

Nearly level to gently sloping, well drained, shallow and very deep soils on inset fans and on fan piedmonts.

Setting

Landform: Fan piedmont

Slope range: 0 to 5 percent

Composition*Extent of the association:*

14 percent of the survey area

Jerag and similar soils: 32 percent

Reyab and similar soils: 30 percent

Armesa and similar soils: 17 percent

Minor soils: 21 percent

Soil Properties and Qualities**Jerag**

Depth class: Shallow

Drainage class: Well drained

Landform: Fan piedmont

Parent material: Alluvium

Surface textural class: Very fine sandy loam

Slope: Gently sloping

Reyab

Depth class: Very deep

Drainage class: Well drained

Landform: Inset fan on fan piedmont

Parent material: Alluvium

Surface textural class: Silt loam

Slope: Nearly level

Armesa

Depth class: Very deep

Drainage class: Well drained

Landform: Inset fan on fan piedmont

Parent material: Alluvium

Surface textural class: Very fine sandy loam

Slope: Gently sloping

Minor Soils

Philder soils on erosion remnants on fan piedmonts

Oryx soils on inset fans on fan piedmonts

Soils on Hills and Mountains

The map units in this group make up about 23 percent of the survey area. The mean annual precipitation is about 15 inches, and the mean annual temperature is about 51 degrees F. Elevation is 4,200 to 8,100 feet. These soils are used mainly for livestock grazing and wildlife habitat.

6. Deama-Rock Outcrop-Penalto Association

Moderately sloping to very steep, well drained, very shallow and shallow soils and Rock outcrop on hills.

Setting

Landform: Hill

Slope range: 5 to 65 percent

Composition

Extent of the association:

3 percent of the survey area
 Deama and similar soils: 49 percent
 Rock outcrop: 34 percent
 Penalto and similar soils: 10 percent
 Minor soils: 7 percent

Soil Properties and Qualities

Deama

Depth class: Very shallow and shallow
Drainage class: Well drained
Landform: Hill
Parent material: Residuum and colluvium
Surface textural class: Very cobbly loam
Slope: Moderately sloping to very steep

Rock outcrop

Landform: Hill
Parent material: Thickly bedded massive limestone

Penalto

Depth class: Shallow
Drainage class: Well drained
Landform: Hill
Parent material: Alluvium
Surface textural class: Very gravelly loam
Slope: Moderately sloping to very steep

Minor Soils

Cale soils in valleys
 Modeama and Penagua soils on mountains

7. Brewster-Rock Outcrop-Stallone Association

Moderately sloping to very steep, well drained, very shallow, shallow, and very deep soils and Rock outcrop on alluvial fans and mountains.

Setting

Landform: Mountain and alluvial fan
Slope range: 5 to 90 percent

Composition

Extent of the association:

4 percent of the survey area
 Brewster and similar soils: 39 percent
 Rock outcrop: 20 percent
 Stallone and similar soils: 19 percent
 Minor soils: 22 percent

Soil Properties and Qualities

Brewster

Depth class: Very shallow and shallow
Drainage class: Well drained
Landform: Mountain
Parent material: Colluvium
Surface textural class: Very gravelly loam
Slope: Very steep

Rock outcrop

Landform: Mountain
Parent material: Thickly bedded massive monzonite

Stallone

Depth class: Very deep
Drainage class: Well drained
Landform: Alluvial fan
Parent material: Alluvium
Surface textural class: Extremely bouldery sandy loam
Slope: Moderately sloping to strongly sloping

Minor Soils

Chipotle soils on inset fans
 Sotol and Crotalus soils on mountains
 Chuzzie soils on stream terraces

8. Bissett-Altuda-Rock Outcrop Association

Moderately sloping to very steep, well drained, very shallow and shallow soils and Rock outcrop on hills.

Setting

Landform: Hill
Slope range: 5 to 65 percent

Composition

Extent of the association:

16 percent of the survey area
 Bissett and similar soils: 38 percent
 Altuda and similar soils: 26 percent
 Rock outcrop: 25 percent
 Minor soils: 11 percent

Soil Properties and Qualities

Bissett

Depth class: Very shallow and shallow
Drainage class: Well drained
Landform: Hill
Parent material: Colluvium

Surface textural class: Very gravelly loam
Slope: Moderately sloping to very steep

Altuda

Depth class: Very shallow and shallow
Drainage class: Well drained
Landform: Hill
Parent material: Colluvium
Surface textural class: Very cobbly loam
Slope: Moderately sloping to very steep

Rock outcrop

Landform: Hill
Parent material: Thickly bedded massive limestone

Minor Soils

Bankston and Allamore soils on hills

Detailed Soil Map Units

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

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

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

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Reyab silt loam, 1 to 3 percent slopes, is a phase of the Reyab series.

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

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. Dozer-Rock outcrop complex, 15 to 35 percent slopes, is an example.

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

Table 4 gives the acreage and proportionate extent

of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Soil descriptions

2—Reyab silt loam, 0 to 1 percent slopes

Map Unit Setting

Landform: Fan apron and inset fan on fan piedmont
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Reyab and similar soils: 95 percent
 Minor components: 5 percent

Properties and Qualities

Reyab soils

Taxonomic classification: Fine-silty, mixed, superactive, thermic Ustic Haplocambids
Geomorphic position: Inset fan on fan piedmont
 Fan apron on fan piedmont
Parent material: Alluvium derived from limestone
Slope: 0 to 1 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.4 inches (high)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: Low
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Loamy
Ecological Site Id: 042XC007NM
Present native vegetation: Desert grassland type consisting of tobosa, burrograss, threeawns, desert holly, globemallow, and mesquite.
Land capability (nonirrigated): 6e
Typical Profile:
 A—0 to 4 inches; silt loam
 Bw1—4 to 12 inches; silt loam

Bw2—12 to 25 inches; silt loam
 C—25 to 80 inches; silt loam

Estimated Minor Components

Copia and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Dune
Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

3—Reyab silt loam, 1 to 3 percent slopes

Map Unit Setting

Landform: Inset fan on fan piedmont
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

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

Properties and Qualities

Reyab soils

Taxonomic classification: Fine-silty, mixed, superactive, thermic Ustic Haplocambids
Geomorphic position: Inset fan on fan piedmont
Parent material: Alluvium derived from limestone
Slope: 1 to 3 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.4 inches (high)
Flooding hazard: Rare
Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Loamy

Ecological Site Id: 042XC007NM

Present native vegetation: Desert grassland type consisting of burrograss, threeawns, tobosa, desert holly, globemallow, tarbush, creosotebush, mesquite, and Christmas cactus.

Land capability (nonirrigated): 6e

Typical Profile:

A—0 to 4 inches; silt loam

Bw1—4 to 12 inches; silt loam

Bw2—12 to 25 inches; silt loam

C—25 to 80 inches; silt loam

Estimated Minor Components

Tinney and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 3 percent

Crossen and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Fan remnant

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

5—Malargo silt loam, 1 to 3 percent slopes

Map Unit Setting

Landform: Fan piedmont

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Malargo and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Malargo soils

Taxonomic classification: Fine-loamy, gypsic, thermic Ustic Haplogypsis

Geomorphic position: Fan piedmont

Parent material: Alluvium derived from limestone and/or alluvium derived from gypsum

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 9.1 inches (high)

Flooding hazard: None

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 4 mmhos/cm (very slightly saline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Gyp Upland

Ecological Site Id: 042XC006NM

Present native vegetation: Desert grassland type consisting of black grama, gypsum grama, burrograss, coldenia, fourwing saltbush, ephedra, and mesquite.

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 2 inches; silt loam

Bw—2 to 22 inches; silt loam

By1—22 to 42 inches; loam

By2—42 to 80 inches; loam

Estimated Minor Components

Pendero and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Sand sheet on basin floor

Slope: 2 to 5 percent

Reyab and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Fan apron on fan piedmont

Inset fan on fan piedmont

Slope: 0 to 5 percent

Copia and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Dune
Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

6—Pendero fine sand, 2 to 5 percent slopes

Map Unit Setting

Landform: Sand sheet on basin floor (fig. 2)

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)
Frost-free period: 200 to 240 days

Map Unit Composition

Pendero and similar soils: 95 percent
 Minor components: 5 percent

Properties and Qualities

Pendero soils

Taxonomic classification: Sandy, mixed, thermic Typic Haplargids
Geomorphic position: Sand sheet on basin floor
Parent material: Eolian sands
Slope: 2 to 5 percent
Drainage class: Excessively drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 5.3 inches (low)
Flooding hazard: None
Ponding hazard: None

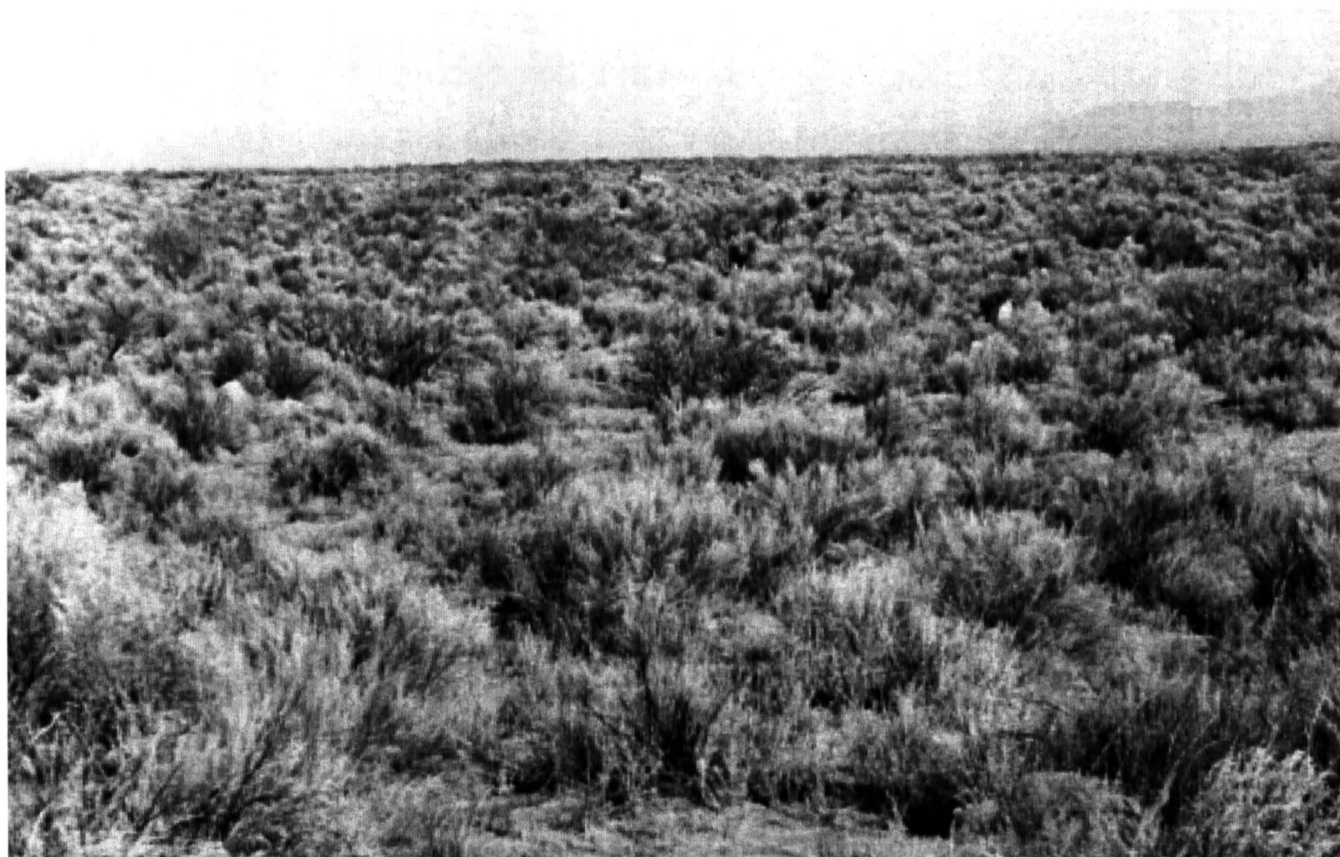


Figure 2.— An area of Pendero fine sand, 2 to 5 percent slopes. This unit occurs as sandsheets overlying basin sediments.

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Sandy

Ecological Site Id: 042XB012NM

Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, sand sagebrush, fourwing saltbush, broom snakeweed, and mesquite.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 1 inch; fine sand

Bw—1 to 5 inches; loamy fine sand

Bt1—5 to 17 inches; loamy fine sand

Bt2—17 to 25 inches; loamy fine sand

Btk1—25 to 45 inches; loamy fine sand

Btk2—45 to 66 inches; loamy fine sand

Bk—66 to 80 inches; loamy fine sand

Estimated Minor Components

Copia and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Dune

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

7—Copia loamy fine sand, 5 to 15 percent slopes

Map Unit Setting

Landform: Dune

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Copia and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Copia soils

Taxonomic classification: Mixed, thermic Typic Torripsamments

Geomorphic position: Dune

Parent material: Eolian sands

Slope: 5 to 15 percent

Drainage class: Excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 5.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Deep Sand

Ecological Site Id: 042XB011NM

Present native vegetation: Desert shrub type consisting of giant dropseed, spike dropseed, mesa dropseed, sand sagebrush, mesquite, and yucca.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 9 inches; loamy fine sand

C1—9 to 24 inches; loamy fine sand

C2—24 to 33 inches; loamy fine sand

C3—33 to 51 inches; loamy fine sand

C4—51 to 71 inches; loamy fine sand

2Btkb—71 to 80 inches; loamy fine sand

Estimated Minor Components

Patriot and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 2 to 5 percent

Cavalry and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 1 to 3 percent

Pendero and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Sand sheet on basin floor

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

10—Dozer-Rock outcrop complex, 35 to 65 percent slopes

Map Unit Setting

Landform: Hill

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Dozer and similar soils: 45 percent

Rock outcrop: 40 percent

Minor components: 15 percent

Properties and Qualities

Dozer soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Lithic Torriorthents

Geomorphic position: Hill

Parent material: Colluvium derived from limestone

Slope: 35 to 65 percent

Surface fragments: About 30 percent gravel, about 30 percent cobbles

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.2 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Limestone Hills

Ecological Site Id: 042XB021NM

Present native vegetation: Desert shrub type consisting of black grama, slender tridens, sideoats grama, threeawns, bush muhly, plains bristlegrass, prickleaf dogweed, ocotillo, whitethorn acacia, creosotebush, mariola, sotol, and lechuguilla.

Land capability (nonirrigated): 7e

Typical Profile:

A—0 to 1 inch; extremely cobbly loam

C—1 to 13 inches; very gravelly loam

R—13 to 80 inches; bedrock

Depth to restrictive feature: 6 to 20 inches to bedrock (lithic)

Rock outcrop

Taxonomic classification:

Geomorphic position: Hill

Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Canutio and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Fan piedmont

Slope: 5 to 30 percent

Delnorte and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Fan piedmont

Slope: 5 to 30 percent

Copia and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Dune

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

11—Cavalry loamy fine sand, 1 to 3 percent slopes

Map Unit Setting

Landform: Alluvial flat on basin floor

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Cavalry and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Cavalry soils

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic Calciargids

Geomorphic position: Alluvial flat on basin floor

Parent material: Alluvium and/or eolian sands

Slope: 1 to 3 percent

Surface fragments: About 5 percent gravel

Drainage class: Well drained

Permeability: 0.6 to 2.0 in/hr (moderate)

Available water capacity: About 8.3 inches (moderate)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Sandy

Ecological Site Id: 042XB012NM

Present native vegetation: Desert shrub type consisting of black grama, mesa dropseed, threeawns, bush muhly, creosotebush, and fourwing saltbush. Brush species dominate, and grasses are sparse.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 3 inches; loamy fine sand

Bt—3 to 14 inches; fine sandy loam

Btk—14 to 27 inches; fine sandy loam

Bk1—27 to 48 inches; fine sandy loam

Bk2—48 to 80 inches; sandy clay loam

Estimated Minor Components

Nations and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 0 to 3 percent

Hueco and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Basin floor

Slope: 1 to 3 percent

Pendero and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Sand sheet on basin floor

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat, military post

For information about management, see the Use and Management section of this publication.

12—Infantry-Sonic complex, 3 to 10 percent slopes

Map Unit Setting

Landform: Fan piedmont

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Infantry and similar soils: 75 percent
Sonic and similar soils: 20 percent
Minor components: 5 percent

Properties and Qualities

Infantry soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic, shallow Calcic Petrocalcids
Geomorphic position: Erosion remnant on fan piedmont
Parent material: Alluvium derived from limestone and/or eolian sands
Slope: 3 to 10 percent
Surface fragments: About 50 percent gravel
Drainage class: Well drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 0.3 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly
Ecological Site Id: 042XC001NM
Present native vegetation: Desert grassland type consisting of sideoats grama, black grama, bush muhly, whitethorn acacia, creosotebush, and mariola.
Land capability (nonirrigated): 7s
Typical Profile:
A—0 to 2 inches; very gravelly sandy loam
Bk—2 to 10 inches; extremely cobbly sandy loam
Bkm—10 to 14 inches; petrocalcic
2Bck1—14 to 22 inches; extremely gravelly loamy coarse sand
3Bck2—22 to 34 inches; extremely gravelly sandy clay loam
4Bck3—34 to 52 inches; extremely cobbly loamy sand
5Bck4—52 to 80 inches; loamy sand
Depth to restrictive feature: 7 to 20 inches to petrocalcic

Sonic soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Ustifluventic Haplocambids
Geomorphic position: Inset fan on fan piedmont
Parent material: Stratified alluvium derived from limestone

Slope: 3 to 10 percent
Surface fragments: About 45 percent gravel
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 5.4 inches (low)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: High
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly
Ecological Site Id: 042XC001NM
Present native vegetation: Desert grassland type consisting of black grama, sideoats grama, bush muhly, Arizona cottontop, cane bluestem, creosotebush, whitethorn acacia, and range ratany.
Land capability (nonirrigated): 6c
Typical Profile:
A—0 to 3 inches; very gravelly fine sandy loam
Bw1—3 to 11 inches; gravelly fine sandy loam
Bw2—11 to 26 inches; extremely cobbly fine sandy loam
Bw3—26 to 38 inches; gravelly silt loam
Bw4—38 to 80 inches; extremely cobbly silt loam

Estimated Minor Components

Crossen and similar soils
Composition: About 2 percent
Component Geomorphic Setting: Fan remnant
Slope: 1 to 5 percent

Tinney and similar soils
Composition: About 2 percent
Component Geomorphic Setting: Inset fan on fan piedmont
Slope: 1 to 3 percent

Dozer and similar soils
Composition: About 1 percent
Component Geomorphic Setting: Hill
Slope: 5 to 65 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

13—Dozer-Rock outcrop complex, 15 to 35 percent slopes

Map Unit Setting

Landform: Hill
Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)
Frost-free period: 200 to 240 days

Map Unit Composition

Dozer and similar soils: 60 percent
 Rock outcrop: 30 percent
 Minor components: 10 percent

Properties and Qualities

Dozer soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Lithic Torriorthents
Geomorphic position: Hill
Parent material: Colluvium derived from limestone
Slope: 15 to 35 percent
Surface fragments: About 30 percent gravel, about 30 percent cobbles
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 1.2 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Limestone Hills
Ecological Site Id: 042XB021NM
Present native vegetation: Desert shrub type consisting of black grama, slender tridens, sideoats grama, threeawns, bush muhly, plains bristleglass, prickleaf dogweed, ocotillo, whitethorn acacia, creosotebush, mariola, sotol, and lechuguilla.
Land capability (nonirrigated): 7e
Typical Profile:
 A—0 to 1 inch; extremely cobbly loam
 C—1 to 13 inches; very gravelly loam

R—13 to 80 inches; bedrock
Depth to restrictive feature: 6 to 20 inches to bedrock (lithic)

Rock outcrop

Geomorphic position: Hill
Parent material: Thickly bedded massive limestone
Flooding hazard: None

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Unspecified
Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Cavalry and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Alluvial flat on basin floor
Slope: 1 to 3 percent
 Bissett and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Hill
Slope: 15 to 35 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

14—Dozer-Rock outcrop complex, 5 to 15 percent slopes

Map Unit Setting

Landform: Hill
Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)
Frost-free period: 200 to 240 days

Map Unit Composition

Dozer and similar soils: 60 percent
 Rock outcrop: 30 percent
 Minor components: 10 percent

Properties and Qualities

Dozer soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Lithic Torriorthents
Geomorphic position: Hill
Parent material: Colluvium derived from limestone
Slope: 5 to 15 percent
Surface fragments: About 30 percent gravel, about 30 percent cobbles
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Limestone Hills
Ecological Site Id: 042XB021NM
Present native vegetation: Desert shrub type consisting of black grama, slender tridens, sideoats grama, threeawns, bush muhly, plains bristlegrass, prickleaf dogweed, ocotillo, whitethorn acacia, creosotebush, mariola, sotol, and lechuguilla.
Land capability (nonirrigated): 7s
Typical Profile:
 A—0 to 1 inch; extremely cobbly loam
 C—1 to 13 inches; very gravelly loam
 R—13 to 80 inches; bedrock
Depth to restrictive feature: 6 to 20 inches to bedrock (lithic)

Rock outcrop

Geomorphic position: Hill
Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Unspecified
Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Crossen and similar soils

Composition: About 5 percent
Component Geomorphic Setting: Fan remnant
Slope: 1 to 5 percent

Cavalry and similar soils

Composition: About 5 percent
Component Geomorphic Setting: Alluvial flat on basin floor
Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

15—Allamore very gravelly loam, 10 to 35 percent slopes

Map Unit Setting

Landform: Hill
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Allamore and similar soils: 95 percent
 Minor components: 5 percent

Properties and Qualities

Allamore soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Lithic Ustic Haplocalcids
Geomorphic position: Hill
Parent material: Colluvium over sandstone
Slope: 10 to 35 percent
Surface fragments: About 15 percent cobbles, about 25 percent gravel
Drainage class: Well drained
Permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 0.7 inches (very low)
Flooding hazard: None

Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Sandstone Hill & Mountain (Desert Grassland)
Ecological Site Id: 042XY255TX
Present native vegetation: Desert grassland type consisting of black grama, sideoats grama, threeawns, bush muhly, whitethorn acacia, creosotebush, ephedra, skeletonleaf goldeneye, and tarbush.
Land capability (nonirrigated): 7s
Typical Profile:
 A—0 to 2 inches; very gravelly loam
 Bk1—2 to 5 inches; very gravelly sandy loam
 Bk2—5 to 12 inches; very gravelly sandy loam
 R—12 to 80 inches; bedrock
Depth to restrictive feature: 8 to 20 inches to bedrock (lithic)

Estimated Minor Components

Dozer and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Hill
Slope: 10 to 35 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

17—Mcnew-Copia complex, 2 to 5 percent slopes

Map Unit Setting

Landform: Alluvial flat on basin floor
Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Mcnew and similar soils: 50 percent
 Copia and similar soils: 40 percent
 Minor components: 10 percent

Properties and Qualities

Mcnew soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Typic Calciargids
Geomorphic position: Alluvial flat on basin floor
Parent material: Eolian sands over alluvium
Slope: 2 to 5 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.8 inches (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Loamy
Ecological Site Id: 042XB014NM
Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, bush muhly, creosotebush, and fourwing saltbush. Grasses are sparse when the site degrades, creating large areas of bare ground.
Land capability (nonirrigated): 7c
Typical Profile:
 A—0 to 3 inches; sandy loam
 Btk1—3 to 8 inches; sandy clay loam
 Btk2—8 to 15 inches; sandy clay loam
 Btk3—15 to 22 inches; sandy clay loam
 Btk4—22 to 33 inches; sandy clay loam
 Btk5—33 to 45 inches; sandy clay loam
 C—45 to 80 inches; sandy loam

Copia soils

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Shrub-coppice dune
Parent material: Eolian sands
Slope: 2 to 5 percent
Drainage class: Somewhat excessively drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 5.3 inches (low)
Flooding hazard: None
Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Dune description: The Copia soil in this map unit occurs as a rather unique landform. It occurs as shrub-coppice dunes, which are small oval to elongate dunes that formed around mesquite plants. Height ranges from 3 to 15 feet, and length ranges from 5 to 75 feet. The spacing between the dunes varies widely and often impedes vehicular travel. The shrub-coppice dunes are made up of young eolian material that mantles a much older surface.

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Deep Sand

Ecological Site Id: 042XB011NM

Present native vegetation: Desert shrub type consisting of mesquite-dominated shrub-coppice dunes.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 9 inches; loamy fine sand

C1—9 to 24 inches; loamy fine sand

C2—24 to 33 inches; loamy fine sand

C3—33 to 51 inches; loamy fine sand

C4—51 to 71 inches; loamy fine sand

2Btkb—71 to 80 inches; loamy fine sand

Estimated Minor Components

Elizario and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 2 to 5 percent

Foxtrot and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Basin floor

Slope: 0 to 5 percent

Nations and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 0 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

20—Mcnew sandy loam, 1 to 3 percent slopes

Map Unit Setting

Landform: Alluvial flat on basin floor

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Mcnew and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Mcnew soils

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

Geomorphic position: Alluvial flat on basin floor

Parent material: Eolian sands over alluvium

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 9.8 inches (high)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Salinity maximum: About 4 mmhos/cm (very slightly saline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Loamy

Ecological Site Id: 042XB014NM

Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, bush muhly, creosotebush, and fourwing saltbush. Grasses are sparse when the site degrades, creating large areas of bare ground.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 3 inches; sandy loam

Btk1—3 to 8 inches; sandy clay loam

Btk2—8 to 15 inches; sandy clay loam
 Btk3—15 to 22 inches; sandy clay loam
 Btk4—22 to 33 inches; sandy clay loam
 Btk5—33 to 45 inches; sandy clay loam
 C—45 to 80 inches; sandy loam

Estimated Minor Components

Hueco and similar soils

Composition: About 9 percent
Component Geomorphic Setting: Basin floor
Slope: 1 to 3 percent

Copia and similar soils

Composition: About 6 percent
Component Geomorphic Setting: Dune
Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

21—Hueco loamy fine sand, 1 to 3 percent slopes

Map Unit Setting

Landform: Basin floor
Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)
Frost-free period: 200 to 240 days

Map Unit Composition

Hueco and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities

Hueco soils

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Argic Petrocalcids
Geomorphic position: Basin floor

Parent material: Eolian sands over alluvium

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 3.9 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Salinity maximum: About 4 mmhos/cm (very slightly saline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Sandy

Ecological Site Id: 042XB012NM

Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, bush muhly, mesquite, yucca elata, and fourwing saltbush. Grasses are sparse when the site degrades, creating large areas of bare ground.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 5 inches; loamy fine sand
 Bt1—5 to 18 inches; fine sandy loam
 Bt2—18 to 30 inches; fine sandy loam
 Bkm—30 to 34 inches; petrocalcic
 C—34 to 80 inches; loam

Depth to restrictive feature: 20 to 40 inches to petrocalcic

Estimated Minor Components

Copia and similar soils

Composition: About 5 percent
Component Geomorphic Setting: Dune
Slope: 2 to 5 percent

Pendero and similar soils

Composition: About 5 percent
Component Geomorphic Setting: Sand sheet on basin floor
Slope: 2 to 5 percent

Nations and similar soils

Composition: About 5 percent
Component Geomorphic Setting: Alluvial flat on basin floor
Slope: 0 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil

Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

22—Copia-Nations complex, 1 to 3 percent slopes

Map Unit Setting

Landform: Alluvial flat on basin floor

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Copia and similar soils: 50 percent

Nations and similar soils: 35 percent

Minor components: 15 percent

Properties and Qualities

Copia soils

Taxonomic classification: Mixed, thermic Typic Torripsammments

Geomorphic position: Shrub-coppice dune

Parent material: Eolian sands

Slope: 1 to 3 percent

Drainage class: Excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 5.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Dune description: The Copia soil in this map unit occurs as a rather unique landform. It occurs as shrub-coppice dunes, which are small oval to elongate dunes that formed around mesquite plants. Height ranges from 3 to 15 feet, and length ranges from 5 to 75 feet. The spacing between the dunes varies widely and often impedes vehicular travel. The shrub-coppice dunes are made up of young eolian material that mantles a much older surface.

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Deep Sand

Ecological Site Id: 042XB011NM

Present native vegetation: Desert shrub type consisting of mesquite-dominated shrub-coppice dunes.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 9 inches; loamy fine sand

C1—9 to 24 inches; loamy fine sand

C2—24 to 33 inches; loamy fine sand

C3—33 to 51 inches; loamy fine sand

C4—51 to 71 inches; loamy fine sand

2Btkb—71 to 80 inches; loamy fine sand

Nations soils

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic Petrocalcids

Geomorphic position: Alluvial flat on basin floor

Parent material: Eolian sands over alluvium

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 3.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Salinity maximum: About 4 mmhos/cm (very slightly saline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Sandy

Ecological Site Id: 042XB012NM

Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, bush muhly, broom snakeweed, and fourwing saltbush. Grasses are sparse when the site degrades, creating large areas of bare ground.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 5 inches; loamy fine sand

2Bw1—5 to 16 inches; fine sandy loam

2Bw2—16 to 25 inches; fine sandy loam

3Bkm—25 to 36 inches; petrocalcic

3Bk—36 to 63 inches; loamy sand

4Btkb—63 to 75 inches; loamy sand

5C—75 to 80 inches; loamy fine sand

Depth to restrictive feature: 20 to 40 inches to petrocalcic

Estimated Minor Components

Mcnew and similar soils

Composition: About 7 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 1 to 5 percent

Hueco and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Basin floor

Slope: 1 to 3 percent

Patriot and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

24—Piquin very gravelly sandy loam, 5 to 15 percent slopes**Map Unit Setting**

Landform: Relict terrace

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Piquin and similar soils: 95 percent

Minor components: 5 percent

Properties and Qualities**Piquin soils**

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

Geomorphic position: Terrace

Parent material: Alluvium derived from igneous rock

Slope: 5 to 15 percent

Surface fragments: About 40 percent gravel

Drainage class: Somewhat excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 3.9 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Gravelly Sand

Ecological Site Id: 042XB024NM

Present native vegetation: Desert shrub type

consisting of creosotebush, mesquite, range ratany, bush muhly, and threeawns. Ground cover is sparse, and drought-tolerant shrubs easily dominate the soil.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 2 inches; very gravelly sandy loam

Bk1—2 to 9 inches; gravelly sandy loam

Bk2—9 to 19 inches; very gravelly sandy loam

Bk3—19 to 30 inches; very gravelly sandy loam

Bk4—30 to 50 inches; gravelly sandy loam

C—50 to 80 inches; gravelly coarse sand

Estimated Minor Components

Yipin and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil

Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

25—Mariola fine sandy loam, 1 to 3 percent slopes

Map Unit Setting

Landform: Erosion remnant on fan piedmont

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Mariola and similar soils: 90 percent

Minor components: 10 percent

Properties and Qualities

Mariola soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Ustalfic Petrocalcids

Geomorphic position: Erosion remnant on fan piedmont

Parent material: Eolian sands over alluvium

Slope: 1 to 3 percent

Surface fragments: About 5 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 4.2 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Gravelly

Ecological Site Id: 042XC001NM

Present native vegetation: Desert grassland type consisting of bush muhly, sand dropseed, black grama, plains bristlegrass, mesquite, mariola, creosotebush, tarbush, and prickly pear.

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 4 inches; fine sandy loam

Bt—4 to 12 inches; sandy clay loam

Btk—12 to 20 inches; sandy clay loam

Bk—20 to 28 inches; gravelly loam

Bkm1—28 to 35 inches; petrocalcic

Bkm2—35 to 56 inches; petrocalcic

2Bk—56 to 80 inches; loam

Depth to restrictive feature: 20 to 40 inches to petrocalcic

Estimated Minor Components

Reyab and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Fan apron on fan piedmont

Slope: 0 to 5 percent

Crossen and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Fan remnant

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

26—Sonic very gravelly fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

Landform: Inset fan on fan piedmont

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Sonic and similar soils: 90 percent

Minor components: 10 percent

Properties and Qualities

Sonic soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Ustifluventic Haplocambids
Geomorphic position: Inset fan on fan piedmont
Parent material: Stratified alluvium derived from limestone
Slope: 8 to 15 percent
Surface fragments: About 45 percent gravel
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 5.4 inches (low)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: High
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly
Ecological Site Id: 042XC001NM
Present native vegetation: Desert grassland type consisting of black grama, sideoats grama, bush muhly, Arizona cottontop, cane bluestem, creosotebush, whitethorn acacia, and range ratany.
Land capability (nonirrigated): 6c
Typical Profile:
 A—0 to 3 inches; very gravelly fine sandy loam
 Bw1—3 to 11 inches; gravelly fine sandy loam
 Bw2—11 to 26 inches; extremely cobbly fine sandy loam
 Bw3—26 to 38 inches; gravelly silt loam
 Bw4—38 to 80 inches; extremely cobbly silt loam

Estimated Minor Components

Reyab and similar soils
Composition: About 4 percent
Component Geomorphic Setting: Fan apron on fan piedmont
 Inset fan on fan piedmont
Slope: 0 to 5 percent
 Bissett and similar soils
Composition: About 3 percent
Component Geomorphic Setting: Hill
Slope: 5 to 15 percent
 Mariola and similar soils
Composition: About 3 percent
Component Geomorphic Setting: Erosion remnant on fan piedmont
Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

27—Sonic very gravelly fine sandy loam, 1 to 8 percent slopes

Map Unit Setting

Landform: Inset fan on fan piedmont
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Sonic and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities

Sonic soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Ustifluventic Haplocambids
Geomorphic position: Inset fan on fan piedmont
Parent material: Stratified alluvium derived from limestone
Slope: 1 to 8 percent
Surface fragments: About 45 percent gravel
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 5.4 inches (low)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: High
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly
Ecological Site Id: 042XC001NM

Present native vegetation: Desert grassland type consisting of black grama, sideoats grama, bush muhly, Arizona cottontop, cane bluestem, creosotebush, whitethorn acacia, and range ratany.

Land capability (nonirrigated): 6c

Typical Profile:

- A—0 to 3 inches; very gravelly fine sandy loam
- Bw1—3 to 11 inches; gravelly fine sandy loam
- Bw2—11 to 26 inches; extremely cobbly fine sandy loam
- Bw3—26 to 38 inches; gravelly silt loam
- Bw4—38 to 80 inches; extremely cobbly silt loam

Estimated Minor Components

Reyab and similar soils

Composition: About 9 percent

Component Geomorphic Setting: Fan apron on fan piedmont

Inset fan on fan piedmont

Slope: 0 to 5 percent

Mariola and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

28—Crossen-Tinney complex, 1 to 3 percent slopes

Map Unit Setting

Landform: Fan piedmont

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Crossen and similar soils: 50 percent

Tinney and similar soils: 40 percent

Minor components: 10 percent

Properties and Qualities

Crossen soils

Taxonomic classification: Loamy, carbonatic, thermic, shallow Calcic Petrocalcids

Geomorphic position: Fan remnant

Parent material: Alluvium derived from limestone and/or colluvium derived from limestone

Slope: 1 to 3 percent

Surface fragments: About 20 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.8 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Gravelly

Ecological Site Id: 042XC001NM

Present native vegetation: Desert grassland type consisting of black grama, bush muhly, Arizona cottontop, plains bristlegrass, blue grama, cane bluestem, and sideoats grama.

Land capability (nonirrigated): 7s

Typical Profile:

- A—0 to 2 inches; gravelly fine sandy loam
- Bk1—2 to 7 inches; gravelly fine sandy loam
- Bk2—7 to 15 inches; gravelly fine sandy loam
- Bkm—15 to 28 inches; petrocalcic
- BCK1—28 to 39 inches; extremely gravelly loam
- BCK2—39 to 80 inches; extremely gravelly sandy loam

Depth to restrictive feature: 6 to 20 inches to petrocalcic

Tinney soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Ustic Calciargids

Geomorphic position: Inset fan on fan piedmont

Parent material: Alluvium

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 9.2 inches (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Loamy
Ecological Site Id: 042XC007NM
Present native vegetation: Desert grassland type consisting of tobosa, burrograss, threeawns, creosotebush, mesquite, tarbush, desert holly, and globemallow.
Land capability (nonirrigated): 6s
Typical Profile:
 A—0 to 3 inches; loam
 Bw—3 to 17 inches; loam
 2Bt—17 to 36 inches; sandy clay loam
 3Bk1—36 to 45 inches; loam
 3Bk2—45 to 57 inches; loam
 3Bk3—57 to 80 inches; loam

Estimated Minor Components

Mariola and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Erosion remnant on fan piedmont
Slope: 1 to 3 percent
 Reyab and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Inset fan on fan piedmont
 Fan apron on fan piedmont
Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

29—Tinney loam, 1 to 3 percent slopes

Map Unit Setting

Landform: Fan piedmont
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Tinney and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities

Tinney soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Ustic Calciargids
Geomorphic position: Inset fan on fan piedmont
Parent material: Alluvium
Slope: 1 to 3 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.2 inches (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Loamy
Ecological Site Id: 042XC007NM
Present native vegetation: Desert grassland type consisting of tobosa, burrograss, threeawns, creosotebush, mesquite, tarbush, desert holly, and globemallow.
Land capability (nonirrigated): 6s
Typical Profile:
 A—0 to 3 inches; loam
 Bw—3 to 17 inches; loam
 2Bt—17 to 36 inches; sandy clay loam
 3Bk1—36 to 45 inches; loam
 3Bk2—45 to 57 inches; loam
 3Bk3—57 to 80 inches; loam

Estimated Minor Components

Mariola and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 1 to 3 percent

Reyab and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Fan apron on fan piedmont

Slope: 0 to 5 percent

Crossen and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Fan remnant

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

30—Crossen gravelly fine sandy loam, 2 to 5 percent slopes

Map Unit Setting

Landform: Fan piedmont

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Crossen and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Crossen soils

Taxonomic classification: Loamy, carbonatic, thermic, shallow Calcic Petrocalcids

Geomorphic position: Fan remnant

Parent material: Alluvium derived from limestone and/or colluvium derived from limestone

Slope: 2 to 5 percent

Surface fragments: About 20 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.8 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Gravelly

Ecological Site Id: 042XC001NM

Present native vegetation: Desert grassland type consisting of black grama, bush muhly, Arizona cottontop, plains bristlegrass, blue grama, cane bluestem, and sideoats grama.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 2 inches; gravelly fine sandy loam

Bk1—2 to 7 inches; gravelly fine sandy loam

Bk2—7 to 15 inches; gravelly fine sandy loam

Bkm—15 to 28 inches; petrocalcic

Bck1—28 to 39 inches; extremely gravelly loam

Bck2—39 to 80 inches; extremely gravelly sandy loam

Depth to restrictive feature: 6 to 20 inches to petrocalcic

Estimated Minor Components

Reyab and similar soils

Composition: About 9 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Fan apron on fan piedmont

Slope: 0 to 5 percent

Tinney and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range

in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

31—Pendero-Copia-Nations complex, 2 to 5 percent slopes

Map Unit Setting

Landform: Basin floor

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Pendero and similar soils: 40 percent

Copia and similar soils: 30 percent

Nations and similar soils: 20 percent

Minor components: 10 percent

Properties and Qualities

Pendero soils

Taxonomic classification: Sandy, mixed, thermic Typic Haplargids

Geomorphic position: Sand sheet on basin floor

Parent material: Eolian sands

Slope: 2 to 5 percent

Drainage class: Excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 5.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Sandy

Ecological Site Id: 042XB012NM

Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, sand sagebrush, fourwing saltbush, broom snakeweed, and mesquite.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 1 inch; fine sand

Bw—1 to 5 inches; loamy fine sand

Bt1—5 to 17 inches; loamy fine sand

Bt2—17 to 25 inches; loamy fine sand

Btk1—25 to 45 inches; loamy fine sand

Btk2—45 to 66 inches; loamy fine sand

Bk—66 to 80 inches; loamy fine sand

Copia soils

Taxonomic classification: Mixed, thermic Typic Torripsamments

Geomorphic position: Shrub-coppice dune

Parent material: Eolian sands

Slope: 2 to 5 percent

Drainage class: Excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 5.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Dune description: The Copia soil in this map unit occurs as a rather unique landform. It occurs as shrub-coppice dunes, which are small oval to elongate dunes that formed around mesquite plants. Height ranges from 3 to 15 feet, and length ranges from 5 to 75 feet. The spacing between the dunes varies widely and often impedes vehicular travel. The shrub-coppice dunes are made up of young eolian material that mantles a much older surface.

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Deep Sand

Ecological Site Id: 042XB011NM

Present native vegetation: Desert shrub type consisting of mesquite-dominated shrub-coppice dunes.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 9 inches; loamy fine sand

C1—9 to 24 inches; loamy fine sand

C2—24 to 33 inches; loamy fine sand

C3—33 to 51 inches; loamy fine sand

C4—51 to 71 inches; loamy fine sand

2Btkb—71 to 80 inches; loamy fine sand

Nations soils

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic Petrocalcids

Geomorphic position: Alluvial flat on basin floor

Parent material: Eolian sands over alluvium
Slope: 2 to 3 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 3.3 inches (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Sandy
Ecological Site Id: 042XB012NM
Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, bush muhly, broom snakeweed, and fourwing saltbush. Grasses are sparse when the site degrades, creating large areas of bare ground.
Land capability (nonirrigated): 7c
Typical Profile:
 A—0 to 5 inches; loamy fine sand
 2Bw1—5 to 16 inches; fine sandy loam
 2Bw2—16 to 25 inches; fine sandy loam
 3Bkm—25 to 36 inches; petrocalcic
 3Bk—36 to 63 inches; loamy sand
 4Btkb—63 to 75 inches; loamy sand
 5C—75 to 80 inches; loamy fine sand
Depth to restrictive feature: 20 to 40 inches to petrocalcic

Estimated Minor Components

Foxtrot and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Basin floor
Slope: 0 to 5 percent
 Mcnew and similar soils
Composition: About 3 percent
Component Geomorphic Setting: Alluvial flat on basin floor
Slope: 1 to 5 percent
 Wessly and similar soils
Composition: About 2 percent
Component Geomorphic Setting: Depression on basin floor
Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication.

Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

33—Bankston extremely channery loam, 15 to 35 percent slopes

Map Unit Setting

Landform: Hill
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Bankston and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities

Bankston soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Ustic Haplocalcids
Geomorphic position: Hill
Parent material: Colluvium derived from dolomite and/or colluvium derived from limestone
Slope: 15 to 35 percent
Surface fragments: About 55 percent channers, about 15 percent gravel
Drainage class: Well drained
Permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 2.1 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Limestone Hills
Ecological Site Id: 042XC020NM
Present native vegetation: Desert grassland type

consisting of sideoats grama, black grama, bush muhly, threeawns, whitethorn acacia, creosotebush, mariola, and javalina bush.

Land capability (nonirrigated): 7e

Typical Profile:

A—0 to 3 inches; extremely channery loam

Bk1—3 to 14 inches; extremely cobbly loam

Bk2—14 to 25 inches; extremely cobbly loam

R—25 to 80 inches; bedrock

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

Estimated Minor Components

Bissett and similar soils

Composition: About 8 percent

Component Geomorphic Setting: Hill

Slope: 15 to 35 percent

Rock outcrop

Composition: About 5 percent

Component Geomorphic Setting: Hill

Reyab and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Inset fan

Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

34—Bankston extremely channery loam, 8 to 15 percent slopes

Map Unit Setting

Landform: Hill

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Bankston and similar soils: 90 percent

Minor components: 10 percent

Properties and Qualities

Bankston soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Ustic Haplocalcids

Geomorphic position: Hill

Parent material: Local colluvium derived from limestone and/or residuum weathered from limestone

Slope: 8 to 15 percent

Surface fragments: About 55 percent channers, about 15 percent gravel

Drainage class: Well drained

Permeability: 0.6 to 2.0 in/hr (moderate)

Available water capacity: About 2.1 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Limestone Hills

Ecological Site Id: 042XC020NM

Present native vegetation: Desert grassland type consisting of sideoats grama, black grama, bush muhly, threeawns, whitethorn acacia, creosotebush, mariola, and javalina bush.

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 3 inches; extremely channery loam

Bk1—3 to 14 inches; extremely cobbly loam

Bk2—14 to 25 inches; extremely cobbly loam

R—25 to 80 inches; bedrock

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

Estimated Minor Components

Bissett and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Hill

Slope: 8 to 15 percent

Crossen and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Fan remnant
Slope: 1 to 5 percent

Rock outcrop

Composition: About 2 percent
Component Geomorphic Setting: Hill

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

35—Foxtrot-Copia complex, 0 to 5 percent slopes

Map Unit Setting

Landform: Basin floor
Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)
Frost-free period: 200 to 240 days

Map Unit Composition

Foxtrot and similar soils: 45 percent
 Copia and similar soils: 40 percent
 Minor components: 15 percent

Properties and Qualities

Foxtrot soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Argic Petrocalcids
Geomorphic position: Alluvial flat on basin floor
Parent material: Eolian sands over alluvium
Slope: 0 to 5 percent
Drainage class: Well drained
Permeability: .001 to .06 in/hr (very slow)
Available water capacity: About 4.8 inches (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Loamy
Ecological Site Id: 042XB014NM
Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, broom snakeweed, and mesquite.
Land capability (nonirrigated): 7c
Typical Profile:
 A—0 to 1 inch; sand
 2Btk1—1 to 6 inches; sandy clay loam
 2Btk2—6 to 29 inches; sandy clay loam
 2Bkm—29 to 53 inches; sandy clay loam
 3Bk—53 to 80 inches; sandy clay loam
Depth to restrictive feature: 20 to 40 inches to petrocalcic

Copia soils

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Shrub-coppice dune
Parent material: Eolian sands
Slope: 1 to 5 percent
Drainage class: Excessively drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 5.3 inches (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Dune description: The Copia soil in this map unit occurs as a rather unique landform. It occurs as shrub-coppice dunes, which are small oval to elongate dunes that formed around mesquite plants. Height ranges from 3 to 15 feet, and length ranges from 5 to 75 feet. The spacing between the dunes varies widely and often impedes vehicular travel. The shrub-coppice dunes are made up of young eolian material that mantles a much older surface.

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Deep Sand
Ecological Site Id: 042XB011NM
Present native vegetation: Desert shrub type consisting of mesquite-dominated shrub-coppice dunes.
Land capability (nonirrigated): 7c
Typical Profile:
 A—0 to 9 inches; loamy fine sand
 C1—9 to 24 inches; loamy fine sand

C2—24 to 33 inches; loamy fine sand
 C3—33 to 51 inches; loamy fine sand
 C4—51 to 71 inches; loamy fine sand
 2Btkb—71 to 80 inches; loamy fine sand

Estimated Minor Components

Patriot and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 2 to 5 percent

Pendero and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Sand sheet on basin floor

Slope: 2 to 5 percent

Mcnew and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

37—Wessly-Copia complex, 1 to 3 percent slopes

Map Unit Setting

Landform: Depression on basin floor

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Wessly and similar soils: 55 percent

Copia and similar soils: 30 percent

Minor components: 15 percent

Properties and Qualities

Wessly soils

Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, thermic Typic Torriorthents

Geomorphic position: Depression on alluvial flat on basin floor

Parent material: Alluvium

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 10.0 inches (high)

Flooding hazard: None

Ponding hazard: Occasional

Runoff class: Negligible

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Draw

Ecological Site Id: 042XB016NM

Present native vegetation: Desert shrub type consisting of mesquite, broom snakeweed, fourwing saltbush, yucca elata, and spectaclepod.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 3 inches; sandy clay loam

Bk1—3 to 6 inches; sandy clay loam

Bk2—6 to 16 inches; sandy clay loam

Bk3—16 to 29 inches; sandy clay loam

Bk4—29 to 46 inches; sandy clay loam

Bk5—46 to 64 inches; sandy clay loam

Bk6—64 to 80 inches; sandy clay loam

Copia soils

Taxonomic classification: Mixed, thermic Typic Torripsamments

Geomorphic position: Shrub-coppice dune

Parent material: Eolian sands

Slope: 1 to 3 percent

Drainage class: Excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 5.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Dune description: The Copia soil in this map unit occurs as a rather unique landform. It occurs as shrub-coppice dunes, which are small oval to elongate dunes

that formed around mesquite plants. Height ranges from 3 to 15 feet, and length ranges from 5 to 75 feet. The spacing between the dunes varies widely and often impedes vehicular travel. The shrub-coppice dunes are made up of young eolian material that mantles a much older surface.

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Deep Sand

Ecological Site Id: 042XB011NM

Present native vegetation: Desert shrub type consisting of mesquite-dominated shrub-coppice dunes.

Land capability (nonirrigated): 7c

Typical Profile:

- A—0 to 9 inches; loamy fine sand
- C1—9 to 24 inches; loamy fine sand
- C2—24 to 33 inches; loamy fine sand
- C3—33 to 51 inches; loamy fine sand
- C4—51 to 71 inches; loamy fine sand
- 2Btkb—71 to 80 inches; loamy fine sand

Estimated Minor Components

Foxtrot and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Basin floor

Slope: 0 to 5 percent

Pendero and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Sand sheet on basin floor

Slope: 2 to 5 percent

Elizario and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

39—Copia-Mcnew-Pendero complex, 1 to 5 percent slopes

Map Unit Setting

Landform: Basin floor

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Copia and similar soils: 35 percent

Mcnew and similar soils: 30 percent

Pendero and similar soils: 25 percent

Minor components: 10 percent

Properties and Qualities

Copia soils

Taxonomic classification: Mixed, thermic Typic Torripsamments

Geomorphic position: Shrub-coppice dune

Parent material: Eolian sands

Slope: 1 to 3 percent

Drainage class: Excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 5.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Dune description: The Copia soil in this map unit occurs as a rather unique landform. It occurs as shrub-coppice dunes, which are small oval to elongate dunes that formed around mesquite plants. Height ranges from 3 to 15 feet, and length ranges from 5 to 75 feet. The spacing between the dunes varies widely and often impedes vehicular travel. The shrub-coppice dunes are made up of young eolian material that mantles a much older surface.

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Deep Sand

Ecological Site Id: 042XB011NM

Present native vegetation: Desert shrub type consisting of mesquite-dominated shrub-coppice dunes.

Land capability (nonirrigated): 7c

Typical Profile:

- A—0 to 9 inches; loamy fine sand
- C1—9 to 24 inches; loamy fine sand
- C2—24 to 33 inches; loamy fine sand
- C3—33 to 51 inches; loamy fine sand
- C4—51 to 71 inches; loamy fine sand
- 2Btkb—71 to 80 inches; loamy fine sand

Mcnew soils

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

Geomorphic position: Alluvial flat on basin floor

Parent material: Eolian sands over alluvium

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 9.8 inches (high)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Salinity maximum: About 4 mmhos/cm (very slightly saline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Loamy

Ecological Site Id: 042XB014NM

Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, bush muhly, creosotebush, and fourwing saltbush. Grasses are sparse when the site degrades, creating large areas of bare ground.

Land capability (nonirrigated): 7c

Typical Profile:

- A—0 to 3 inches; sandy loam
- Btk1—3 to 8 inches; sandy clay loam
- Btk2—8 to 15 inches; sandy clay loam
- Btk3—15 to 22 inches; sandy clay loam
- Btk4—22 to 33 inches; sandy clay loam
- Btk5—33 to 45 inches; sandy clay loam
- C—45 to 80 inches; sandy loam

Pendero soils

Taxonomic classification: Sandy, mixed, thermic Typic Haplargids

Geomorphic position: Sand sheet on basin floor

Parent material: Eolian sands

Slope: 2 to 5 percent

Drainage class: Excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 5.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Sandy

Ecological Site Id: 042XB012NM

Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, sand sagebrush, fourwing saltbush, broom snakeweed, and mesquite.

Land capability (nonirrigated): 7c

Typical Profile:

- A—0 to 1 inch; fine sand
- Bw—1 to 5 inches; loamy fine sand
- Bt1—5 to 17 inches; loamy fine sand
- Bt2—17 to 25 inches; loamy fine sand
- Btk1—25 to 45 inches; loamy fine sand
- Btk2—45 to 66 inches; loamy fine sand
- Bk—66 to 80 inches; loamy fine sand

Estimated Minor Components

Elizario and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 2 to 5 percent

Patriot and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 2 to 5 percent

Foxtrot and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Basin floor

Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

40—Mcnew-Copia-Foxtrot complex, 1 to 5 percent slopes

Map Unit Setting

Landform: Basin floor
Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)
Frost-free period: 200 to 240 days

Map Unit Composition

Mcnew and similar soils: 35 percent
 Copia and similar soils: 30 percent
 Foxtrot and similar soils: 20 percent
 Minor components: 15 percent

Properties and Qualities

Mcnew soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Typic Calciargids
Geomorphic position: Alluvial flat on basin floor
Parent material: Eolian sands over alluvium
Slope: 1 to 3 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.8 inches (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Loamy
Ecological Site Id: 042XB014NM
Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, bush muhly, creosotebush, and fourwing saltbush. Grasses are sparse when the site degrades, creating large areas of bare ground.
Land capability (nonirrigated): 7c
Typical Profile:

A—0 to 3 inches; sandy loam
 Btk1—3 to 8 inches; sandy clay loam
 Btk2—8 to 15 inches; sandy clay loam
 Btk3—15 to 22 inches; sandy clay loam
 Btk4—22 to 33 inches; sandy clay loam
 Btk5—33 to 45 inches; sandy clay loam

C—45 to 80 inches; sandy loam

Copia soils

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Shrub-coppice dune
Parent material: Eolian sands
Slope: 1 to 3 percent
Drainage class: Excessively drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 5.3 inches (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Dune description: The Copia soil in this map unit occurs as a rather unique landform. It occurs as shrub-coppice dunes, which are small oval to elongate dunes that formed around mesquite plants. Height ranges from 3 to 15 feet, and length ranges from 5 to 75 feet. The spacing between the dunes varies widely and often impedes vehicular travel. The shrub-coppice dunes are made up of young eolian material that mantles a much older surface.

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Deep Sand
Ecological Site Id: 042XB011NM
Present native vegetation: Desert shrub type consisting of mesquite-dominated shrub-coppice dunes.
Land capability (nonirrigated): 7c
Typical Profile:

A—0 to 9 inches; loamy fine sand
 C1—9 to 24 inches; loamy fine sand
 C2—24 to 33 inches; loamy fine sand
 C3—33 to 51 inches; loamy fine sand
 C4—51 to 71 inches; loamy fine sand
 2Btkb—71 to 80 inches; loamy fine sand

Foxtrot soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Argic Petrocalcids
Geomorphic position: Alluvial flat on basin floor
Parent material: Eolian sands over alluvium
Slope: 2 to 5 percent
Drainage class: Well drained
Permeability: .001 to .06 in/hr (very slow)
Available water capacity: About 4.8 inches (low)
Flooding hazard: None

Ponding hazard: None

Runoff class: High

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Loamy

Ecological Site Id: 042XB014NM

Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, broom snakeweed, and mesquite.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 1 inch; sand

2Btk1—1 to 6 inches; sandy clay loam

2Btk2—6 to 29 inches; sandy clay loam

2Bkm—29 to 53 inches; sandy clay loam

3Bk—53 to 80 inches; sandy clay loam

Depth to restrictive feature: 20 to 40 inches to petrocalcic

Estimated Minor Components

Wessly and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Depression on basin floor

Slope: 0 to 5 percent

Patriot and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 2 to 5 percent

Elizario and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

41—Elizario-Copia complex, 2 to 5 percent slopes

Map Unit Setting

Landform: Slightly depressed alluvial flat on basin floor

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Elizario and similar soils: 50 percent

Copia and similar soils: 35 percent

Minor components: 15 percent

Properties and Qualities

Elizario soils

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

Geomorphic position: Alluvial flat on basin floor

Parent material: Eolian sands over alluvium

Slope: 2 to 5 percent

Surface fragments: About 2 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 9.6 inches (high)

Flooding hazard: None

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 4 mmhos/cm (very slightly saline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Loamy

Ecological Site Id: 042XB014NM

Present native vegetation: Desert shrub type consisting of fourwing saltbush, broom snakeweed, and dropseeds.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 2 inches; sand

2Btk1—2 to 6 inches; sandy clay loam

2Btk2—6 to 20 inches; sandy clay loam

2Btk3—20 to 31 inches; sandy clay loam

3Bk1—31 to 48 inches; silt loam

3Bk2—48 to 59 inches; silt loam

4C—59 to 80 inches; sandy clay loam

Copia soils

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Shrub-coppice dune
Parent material: Eolian sands
Slope: 2 to 5 percent
Drainage class: Excessively drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 5.3 inches (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Dune description: The Copia soil in this map unit occurs as a rather unique landform. It occurs as shrub-coppice dunes, which are small oval to elongate dunes that formed around mesquite plants. Height ranges from 3 to 15 feet, and length ranges from 5 to 75 feet. The spacing between the dunes varies widely and often impedes vehicular travel. The shrub-coppice dunes are made up of young eolian material that mantles a much older surface.

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Deep Sand
Ecological Site Id: 042XB011NM
Present native vegetation: Desert shrub type consisting of mesquite-dominated shrub-coppice dunes.
Land capability (nonirrigated): 7c
Typical Profile:
 A—0 to 9 inches; loamy fine sand
 C1—9 to 24 inches; loamy fine sand
 C2—24 to 33 inches; loamy fine sand
 C3—33 to 51 inches; loamy fine sand
 C4—51 to 71 inches; loamy fine sand
 2Btkb—71 to 80 inches; loamy fine sand

Estimated Minor Components

Mcnew and similar soils
Composition: About 6 percent
Component Geomorphic Setting: Alluvial flat on basin floor
Slope: 1 to 5 percent
 Patriot and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Alluvial flat on basin floor
Slope: 2 to 5 percent

Wessly and similar soils

Composition: About 4 percent
Component Geomorphic Setting: Depression on basin floor
Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

42—Copia-Patriot complex, 2 to 5 percent slopes**Map Unit Setting**

Landform: Alluvial flat on basin floor
Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)
Frost-free period: 200 to 240 days

Map Unit Composition

Copia and similar soils: 60 percent
 Patriot and similar soils: 30 percent
 Minor components: 10 percent

Properties and Qualities**Copia soils**

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Shrub-coppice dune
Parent material: Eolian sands
Slope: 2 to 5 percent
Drainage class: Excessively drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 5.3 inches (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Dune description: The Copia soil in this map unit occurs as a rather unique landform. It occurs as shrub-coppice dunes, which are small oval to elongate dunes that formed around mesquite plants. Height ranges from 3 to 15 feet, and length ranges from 5 to 75 feet. The spacing between the dunes varies widely and often impedes vehicular travel. The shrub-coppice dunes are made up of young eolian material that mantles a much older surface.

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Deep Sand

Ecological Site Id: 042XB011NM

Present native vegetation: Desert shrub type consisting of mesquite-dominated shrub-coppice dunes.

Land capability (nonirrigated): 7c

Typical Profile:

- A—0 to 9 inches; loamy fine sand
- C1—9 to 24 inches; loamy fine sand
- C2—24 to 33 inches; loamy fine sand
- C3—33 to 51 inches; loamy fine sand
- C4—51 to 71 inches; loamy fine sand
- 2Btkb—71 to 80 inches; loamy fine sand

Patriot soils

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic Calciargids

Geomorphic position: Alluvial flat on basin floor

Parent material: Eolian sands over alluvium

Slope: 2 to 5 percent

Drainage class: Well drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 4.9 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Sandy

Ecological Site Id: 042XB012NM

Present native vegetation: Desert shrub type consisting of dropseeds, threeawns, fourwing saltbush, sand sagebrush, and broom snakeweed.

Land capability (nonirrigated): 7c

Typical Profile:

- A—0 to 3 inches; sand
- Bt—3 to 6 inches; sandy loam

Btk1—6 to 9 inches; sandy loam

Btk2—9 to 19 inches; sandy loam

Btk3—19 to 28 inches; sandy loam

Bk1—28 to 39 inches; loamy sand

Bk2—39 to 51 inches; loamy sand

Bk3—51 to 80 inches; loamy sand

Estimated Minor Components

Pendero and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Sand sheet on basin floor

Slope: 2 to 5 percent

Nations and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Alluvial flat on basin floor

Slope: 0 to 3 percent

Foxtrot and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Basin floor

Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

43—Chaparral gravelly sandy loam, 2 to 5 percent slopes

Map Unit Setting

Landform: Alluvial fan

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Chaparral and similar soils: 95 percent

Minor components: 5 percent

Properties and Qualities

Chaparral soils

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Ustic Haplocambids
Geomorphic position: Erosion remnant on fan piedmont, alluvial fan
Parent material: Gravelly alluvium
Slope: 2 to 5 percent
Surface fragments: About 1 percent cobbles, about 15 percent gravel
Drainage class: Well drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 4.3 inches (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly
Ecological Site Id: 042XC001NM
Present native vegetation: Desert grassland type consisting of needle grama, Mexican witchgrass, bush muhly, blue grama, ephedra, and mesquite.
Land capability (nonirrigated): 6s
Typical Profile:
 A—0 to 7 inches; gravelly sandy loam
 Bw1—7 to 16 inches; gravelly sandy loam
 Bw2—16 to 25 inches; gravelly sandy loam
 Bw3—25 to 36 inches; gravelly sandy loam
 C1—36 to 45 inches; gravelly loamy sand
 C2—45 to 52 inches; gravelly coarse sand
 C3—52 to 80 inches; gravelly sandy loam

Estimated Minor Components

Condron and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Inset fan on fan piedmont
Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

44—Condron sand, 2 to 5 percent slopes

Map Unit Setting

Landform: Inset fan on fan piedmont
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Condron and similar soils: 95 percent
 Minor components: 5 percent

Properties and Qualities

Condron soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Ustic Haplargids
Geomorphic position: Inset fan on fan piedmont
Parent material: Eolian sands over alluvium derived from igneous rock
Slope: 2 to 5 percent
Drainage class: Well drained
Permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 7.5 inches (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Sandy Loam (Desert Grassland)
Ecological Site Id: 042XY256TX
Present native vegetation: Desert grassland type consisting of black grama, bush muhly, Arizona cottontop, plains bristlegrass, cane bluestem, globemallow, ephedra, and mesquite.
Land capability (nonirrigated): 6c
Typical Profile:
 A—0 to 2 inches; sand

2Bt1—2 to 11 inches; sandy loam
 2Bt2—11 to 19 inches; sandy clay loam
 2Bt3—19 to 30 inches; sandy clay loam
 3Bt4—30 to 80 inches; very gravelly sandy clay loam

Estimated Minor Components

Chaparral and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

45—Globe clay, 0 to 1 percent slopes

Map Unit Setting

Landform: Depressional lake plain on basin floor (fig. 3)

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Globe and similar soils: 95 percent

Minor components: 5 percent

Properties and Qualities

Globe soils

Taxonomic classification: Fine, smectitic, thermic Chromic Haplotorrerts

Geomorphic position: Lake plain on basin floor

Parent material: Clayey pluvial lacustrine deposits

Slope: 0 to 1 percent

Drainage class: Poorly drained

Permeability: .06 to 0.2 in/hr (slow)

Available water capacity: About 8.9 inches (moderate)

Flooding hazard: None

Ponding hazard: Occasional

Seasonal high water table depth: About 7 to 10 inches

Runoff class: Negligible

Salinity maximum: About 4 mmhos/cm (very slightly saline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Unspecified

Present native vegetation: Desert shrub type consisting of bitterweed, perennial peppergrass, and Texas blueweed.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 2 inches; clay

Bw—2 to 8 inches; clay

Bss1—8 to 16 inches; clay

Bss2—16 to 50 inches; clay

C—50 to 80 inches; clay

Estimated Minor Components

Caticon and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Basin floor

Slope: 1 to 3 percent

Reyab and similar soils

Composition: About 1 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Fan apron on fan piedmont

Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

47—Caticon silty clay, 1 to 3 percent slopes

Map Unit Setting

Landform: Basin floor



Figure 3.—An area of Globe Clay, 0 to 1 percent slopes, at Coe Lake. Cracks are up to 6 inches wide.

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Caticon and similar soils: 95 percent

Minor components: 5 percent

Properties and Qualities

Caticon soils

Taxonomic classification: Fine, smectitic, thermic
Vertic Haplocambids

Geomorphic position: Lakebed on basin floor

Parent material: Alluvium and/or clayey pluvial
lacustrine deposits

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 8.9 inches (moderate)

Flooding hazard: None

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Clayey

Ecological Site Id: 042XB023NM

Present native vegetation: Desert grassland type consisting of tobosa, burrograss, annual forbs, and mesquite.

Land capability (nonirrigated): 7c

Typical Profile:

- A—0 to 2 inches; silty clay
- Bw1—2 to 8 inches; silty clay
- Bw2—8 to 22 inches; clay
- Bk1—22 to 35 inches; clay
- Bk2—35 to 80 inches; clay

Estimated Minor Components

Globe and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Lake plain on basin floor

Slope: 0 to 1 percent

Copia and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Dune

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

48—Reyab loam, 0 to 1 percent slopes, ponded

Map Unit Setting

Landform: Inset fan on fan piedmont

Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Reyab and similar soils: 95 percent

Minor components: 5 percent

Properties and Qualities

Reyab soils

Taxonomic classification: Fine-silty, mixed, superactive, thermic Ustic Haplocambids

Geomorphic position: Inset fan on fan piedmont

Parent material: Alluvium derived from limestone

Slope: 0 to 1 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 9.4 inches (high)

Flooding hazard: None

Ponding hazard: Occasional

Runoff class: Low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Loamy Bottom

Ecological Site Id: 042XD002NM

Present native vegetation: Mixed prairie type consisting of alkali sacaton, vine mesquite, tobosa, burrograss, and ear muhly.

Land capability (nonirrigated): 6e

Typical Profile:

- A—0 to 4 inches; loam
- Bw1—4 to 12 inches; silt loam
- Bw2—12 to 25 inches; silt loam
- C—25 to 80 inches; silt loam

Estimated Minor Components

Armesa and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 5 percent

Double and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Alluvial fan

Slope: 2 to 5 percent

Salado and similar soils

Composition: About 1 percent

Component Geomorphic Setting: Fan piedmont

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

49—Reyab loam, 0 to 1 percent slopes

Map Unit Setting

Landform: Inset fan on fan piedmont

Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Reyab and similar soils: 90 percent

Minor components: 10 percent

Properties and Qualities

Reyab soils

Taxonomic classification: Fine-silty, mixed, superactive, thermic Ustic Haplocambids

Geomorphic position: Inset fan on fan piedmont

Parent material: Alluvium derived from limestone

Slope: 0 to 1 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 9.4 inches (high)

Flooding hazard: Rare

Ponding hazard: None

Runoff class: Low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Loamy

Ecological Site Id: 042XD001NM

Present native vegetation: Mixed prairie type consisting of blue grama, cane bluestem, vine mesquite, tobosa, and sand muhly.

Land capability (nonirrigated): 6e

Typical Profile:

A—0 to 4 inches; loam

Bw1—4 to 12 inches; silt loam

Bw2—12 to 25 inches; silt loam

C—25 to 80 inches; silt loam

Estimated Minor Components

Armesa and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 5 percent

Salado and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Fan piedmont

Slope: 1 to 3 percent

Oryx and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

50—Reyab loam, 1 to 5 percent slopes

Map Unit Setting

Landform: Inset fan on fan piedmont (fig. 4)

Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Reyab and similar soils: 90 percent

Minor components: 10 percent

Properties and Qualities

Reyab soils

Taxonomic classification: Fine-silty, mixed, superactive, thermic Ustic Haplocambids

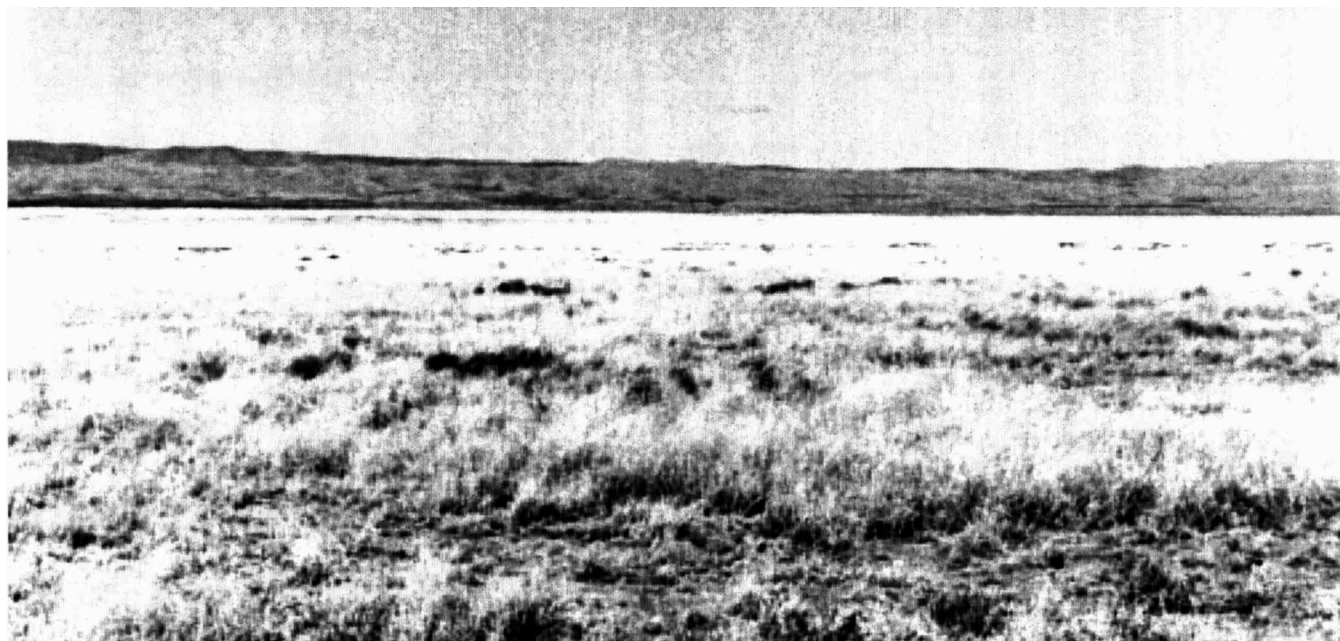


Figure 4.—An area of Reyab loam, 1 to 5 percent slopes. This soil is found on broad inset fans that receive runoff from adjoining higher sites.

Geomorphic position: Inset fan on fan piedmont
Parent material: Alluvium derived from limestone
Slope: 1 to 5 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.4 inches (high)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: Medium
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Loamy
Ecological Site Id: 042XD001NM
Present native vegetation: Mixed prairie type
 consisting of tobosa, burrograss, blue grama, vine
 mesquite, and desert holly.
Land capability (nonirrigated): 6e
Typical Profile:
 A—0 to 4 inches; loam
 Bw1—4 to 12 inches; silt loam
 Bw2—12 to 25 inches; silt loam
 C—25 to 80 inches; silt loam

Estimated Minor Components

Armesa and similar soils

Composition: About 6 percent
Component Geomorphic Setting: Inset fan on fan
 piedmont
Slope: 1 to 5 percent

Philder and similar soils
Composition: About 2 percent
Component Geomorphic Setting: Erosion remnant
 on fan piedmont
Slope: 2 to 5 percent

Jerag and similar soils
Composition: About 2 percent
Component Geomorphic Setting: Fan piedmont
Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

51—Bissett-Rock outcrop complex, 5 to 15 percent slopes

Map Unit Setting

Landform: Hill
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Bissett and similar soils: 65 percent
 Rock outcrop: 20 percent
 Minor components: 15 percent

Properties and Qualities

Bissett soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Lithic Ustic Haplocalcids
Geomorphic position: Hill
Parent material: Colluvium derived from limestone
Slope: 5 to 15 percent
Surface fragments: About 15 percent cobbles, about 35 percent gravel
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 1.3 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Limestone Hill & Mountain (Desert Grassland)
Ecological Site Id: 042XY249TX
Present native vegetation: Desert grassland type consisting of sideoats grama, black grama, tridens, tobosa, whitethorn acacia, mariola, creosotebush, and goldeneye.
Land capability (nonirrigated): 7s
Typical Profile:
 Ak—0 to 3 inches; very gravelly loam
 Bk—3 to 13 inches; very gravelly loam
 R—13 to 80 inches; bedrock

Depth to restrictive feature: 7 to 19 inches to bedrock (lithic)

Rock outcrop

Geomorphic position: Hill
Parent material: Coarsely fractured limestone

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Unspecified
Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Bankston and similar soils
Composition: About 8 percent
Component Geomorphic Setting: Hill
Slope: 8 to 15 percent
 Infantry and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Erosion remnant on fan piedmont
Slope: 3 to 15 percent
 Reyab and similar soils
Composition: About 2 percent
Component Geomorphic Setting: Inset fan on fan piedmont
Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

52—Bissett-Rock outcrop complex, 15 to 35 percent slopes

Map Unit Setting

Landform: Hill
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Bissett and similar soils: 65 percent

Rock outcrop: 20 percent

Minor components: 15 percent

Properties and Qualities

Bissett soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Lithic Ustic Haplocalcids

Geomorphic position: Hill

Parent material: Colluvium derived from limestone

Slope: 15 to 35 percent

Surface fragments: About 35 percent gravel, about 15 percent cobbles

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.3 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Limestone Hill & Mountain (Desert Grassland)

Ecological Site Id: 042XY249TX

Present native vegetation: Desert grassland type consisting of sideoats grama, black grama, tridens, tobosa, whitethorn acacia, mariola, creosotebush, and goldeneye.

Land capability (nonirrigated): 7e

Typical Profile:

Ak—0 to 3 inches; very gravelly loam

Bk—3 to 13 inches; very gravelly loam

R—13 to 80 inches; bedrock

Depth to restrictive feature: 7 to 19 inches to bedrock (lithic)

Rock outcrop

Geomorphic position: Hill

Parent material: Coarsely fractured limestone

Flooding hazard: None

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Infantry and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 3 to 15 percent

Altuda and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Hill

Slope: 15 to 35 percent

Reyab and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

53—Bissett-Rock outcrop complex, 35 to 65 percent slopes

Map Unit Setting

Landform: Hill (fig. 5)

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days



Figure 5.—An area of limestone-derived Bissett-Rock outcrop complex, 35 to 65 percent slopes. Sideoats grama is the dominant grass in this unit.

Map Unit Composition

Bissett and similar soils: 65 percent
 Rock outcrop: 25 percent
 Minor components: 10 percent

Properties and Qualities

Bissett soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Lithic Ustic Haplocalcids
Geomorphic position: Hill
Parent material: Colluvium derived from limestone
Slope: 35 to 65 percent
Surface fragments: About 35 percent gravel, about 15 percent cobbles

Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 1.3 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Limestone Hill & Mountain (Desert Grassland)
Ecological Site Id: 042XY249TX
Present native vegetation: Desert grassland type

consisting of sideoats grama, black grama, tridens, tobosa, whitethorn acacia, mariola, creosotebush, and goldeneye.

Land capability (nonirrigated): 7e

Typical Profile:

Ak—0 to 3 inches; very gravelly loam

Bk—3 to 13 inches; very gravelly loam

R—13 to 80 inches; bedrock

Depth to restrictive feature: 7 to 19 inches to bedrock (lithic)

Rock outcrop

Geomorphic position: Hill

Parent material: Coarsely fractured limestone

Flooding hazard: None

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Altuda and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Hill

Slope: 35 to 65 percent

Tinney and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 3 percent

Infantry and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 3 to 15 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

54—Altuda-Rock outcrop complex, 5 to 15 percent slopes

Map Unit Setting

Landform: Hill

Elevation: 4,900 to 6,000 feet (1,494 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Altuda and similar soils: 70 percent

Rock outcrop: 15 percent

Minor components: 15 percent

Properties and Qualities

Altuda soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Lithic Calciustolls

Geomorphic position: Hill

Parent material: Colluvium derived from limestone

Slope: 5 to 15 percent

Surface fragments: About 20 percent cobbles, about 30 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 0.9 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Limestone Hills

Ecological Site Id: 042XE001NM

Present native vegetation: Mixed prairie type consisting of black grama, blue grama, sideoats grama, curlyleaf muhly, catclaw, agave and beargrass.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 2 inches; very cobbly loam

Bk—2 to 12 inches; extremely cobbly loam

R—12 to 80 inches; bedrock

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

Rock outcrop*Geomorphic position:* Hill*Parent material:* Coarsely fractured limestone**Interpretive Groups***Major Land Resource Area:* 42*Ecological Site:* Unspecified*Present native vegetation:* Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.**Estimated Minor Components**

Armesa and similar soils

Composition: About 5 percent*Component Geomorphic Setting:* Inset fan on fan piedmont*Slope:* 1 to 5 percent

Reyab and similar soils

Composition: About 5 percent*Component Geomorphic Setting:* Inset fan on fan piedmont*Slope:* 0 to 5 percent

Philder and similar soils

Composition: About 5 percent*Component Geomorphic Setting:* Erosion remnant on fan piedmont*Slope:* 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management*Major Use:* livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

55—Altuda-Rock outcrop complex, 15 to 35 percent slopes**Map Unit Setting***Landform:* Hill (fig. 6)*Elevation:* 4,900 to 6,000 feet (1,494 to 1,829 meters)*Mean annual precipitation:* 12 to 14 inches (305 to 356 millimeters)*Average annual air temperature:* 58 to 61 degrees F (14.4 to 16.1 degrees C)*Frost-free period:* 140 to 180 days**Map Unit Composition**

Altuda and similar soils: 60 percent

Rock outcrop: 30 percent

Minor components: 10 percent

Properties and Qualities**Altuda soils***Taxonomic classification:* Loamy-skeletal, carbonatic, thermic Lithic Calciustolls*Geomorphic position:* Hill*Parent material:* Colluvium derived from limestone*Slope:* 15 to 35 percent*Surface fragments:* About 30 percent gravel, about 20 percent cobbles*Drainage class:* Well drained*Permeability:* 0.2 to 0.6 in/hr (moderately slow)*Available water capacity:* About 0.9 inches (very low)*Flooding hazard:* None*Ponding hazard:* None*Runoff class:* Very high*Salinity maximum:* About 2 mmhos/cm (nonsaline)*Sodium adsorption ratio maximum:* About 0 (nonsodic)**Interpretive Groups***Major Land Resource Area:* 42*Ecological Site:* Limestone Hills*Ecological Site Id:* 042XE001NM*Present native vegetation:* Mixed prairie type consisting of sideoats grama, curlyleaf muhly, blue grama, yucca, ephedra, and beargrass.*Land capability (nonirrigated):* 7e*Typical Profile:*

A—0 to 2 inches; very cobbly loam

Bk—2 to 12 inches; extremely cobbly loam

R—12 to 80 inches; bedrock

Depth to restrictive feature: 8 to 20 inches to bedrock (lithic)**Rock outcrop***Geomorphic position:* Hill*Parent material:* Coarsely fractured limestone**Interpretive Groups***Major Land Resource Area:* 42*Ecological Site:* Unspecified*Present native vegetation:* Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.**Estimated Minor Components**

Philder and similar soils

Composition: About 5 percent



Figure 6.—An area of Salado loam, 1 to 3 percent slopes, in the foreground. Altuda-Rock outcrop complex, 15 to 35 percent slopes, in the background. The limestone rock outcrop can comprise up to 30 percent of this unit.

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 2 to 5 percent

Bissett and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Hill

Slope: 15 to 35 percent

Jerag and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Fan piedmont

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range

in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

56—Altuda-Rock outcrop complex, 35 to 65 percent slopes

Map Unit Setting

Landform: Hill

Elevation: 4,900 to 6,000 feet (1,494 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F
(14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Altuda and similar soils: 50 percent

Rock outcrop: 40 percent

Minor components: 10 percent

Properties and Qualities

Altuda soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Lithic Calciustolls

Geomorphic position: Hill

Parent material: Colluvium derived from limestone

Slope: 35 to 65 percent

Surface fragments: About 30 percent gravel, about 20 percent cobbles

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 0.9 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Limestone Hills

Ecological Site Id: 042XE001NM

Present native vegetation: Mixed prairie type consisting of sideoats grama, curlyleaf muhly, blue grama, yucca, skunkbush sumac, ephedra, and beargrass.

Land capability (nonirrigated): 7e

Typical Profile:

A—0 to 2 inches; very cobbly loam

Bk—2 to 12 inches; extremely cobbly loam

R—12 to 80 inches; bedrock

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

Rock outcrop

Geomorphic position: Hill

Parent material: Coarsely fractured limestone

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of

exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Deama and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Hill

Slope: 35 to 65 percent

Bissett and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Hill

Slope: 35 to 65 percent

Jerag and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Fan piedmont

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

59—Salado loam, 1 to 3 percent slopes

Map Unit Setting

Landform: Fan piedmont

Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F
(14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Salado and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Salado soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Ustic Haplocalcids

Geomorphic position: Fan piedmont
Parent material: Calcareous alluvium derived from limestone
Slope: 1 to 3 percent
Surface fragments: About 5 percent gravel
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.8 inches (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Loamy
Ecological Site Id: 042XD001NM
Present native vegetation: Mixed prairie type consisting of blue grama, tobosa, vine mesquite, alkali sacaton, and sand muhly.
Land capability (nonirrigated): 6c
Typical Profile:
 A1—0 to 1 inch; loam
 A2—1 to 5 inches; loam
 Bw—5 to 13 inches; silt loam
 Bk1—13 to 27 inches; silt loam
 Bk2—27 to 41 inches; loam
 Bk3—41 to 70 inches; clay loam
 Bk4—70 to 80 inches; sandy clay loam

Estimated Minor Components

Armesa and similar soils
Composition: About 6 percent
Component Geomorphic Setting: Inset fan on fan piedmont
Slope: 1 to 5 percent
 Philder and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Erosion remnant on fan piedmont
Slope: 2 to 5 percent
 Reyab and similar soils
Composition: About 4 percent
Component Geomorphic Setting: Inset fan on fan piedmont
Slope: 0 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil

Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

61—Philder-Jerag complex, 2 to 5 percent slopes

Map Unit Setting

Landform: Fan piedmont
Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)
Frost-free period: 140 to 180 days

Map Unit Composition

Philder and similar soils: 70 percent
 Jerag and similar soils: 15 percent
 Minor components: 15 percent

Properties and Qualities

Philder soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic, shallow Calcic Petrocalcids
Geomorphic position: Erosion remnant on fan piedmont
Parent material: Eolian sands over alluvium derived from limestone
Slope: 2 to 5 percent
Surface fragments: About 30 percent gravel
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 1.3 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly
Ecological Site Id: 042XD007NM
Present native vegetation: Mixed prairie type consisting of black grama, blue grama, sand

muhly, yucca elata, creosotebush, mesquite, ephedra, and littleleaf sumac.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 2 inches; gravelly loam

Bw—2 to 5 inches; very gravelly loam

Bk—5 to 16 inches; very gravelly loam

Bkm1—16 to 31 inches; extremely gravelly petrocalcic

Bkm2—31 to 56 inches; extremely cobbly petrocalcic

2B'k—56 to 80 inches; loam

Depth to restrictive feature: 14 to 20 inches to petrocalcic

Jerag soils

Taxonomic classification: Loamy, mixed, superactive, thermic, shallow Ustalfic Petrocalcids

Geomorphic position: Fan piedmont

Parent material: Eolian sands over alluvium derived from limestone

Slope: 2 to 5 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 2.6 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Shallow Sandy

Ecological Site Id: 042XD006NM

Present native vegetation: Mixed prairie type consisting of black grama, blue grama, vine mesquite, New Mexico feathergrass, sand muhly, winterfat, cholla, and yucca.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 3 inches; very fine sandy loam

Bt—3 to 9 inches; sandy clay loam

Bk—9 to 19 inches; gravelly loam

Bkm—19 to 25 inches; petrocalcic

2Bk—25 to 80 inches; gravelly silt loam

Depth to restrictive feature: 14 to 20 inches to petrocalcic

Estimated Minor Components

Double and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Alluvial fan

Slope: 2 to 5 percent

Reyab and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 0 to 5 percent

Armesa and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

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

Map Unit Setting

Landform: Fan piedmont

Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Jerag and similar soils: 95 percent

Minor components: 5 percent

Properties and Qualities

Jerag soils

Taxonomic classification: Loamy, mixed, superactive, thermic, shallow Ustalfic Petrocalcids

Geomorphic position: Fan piedmont

Parent material: Eolian sands over alluvium derived from limestone

Slope: 1 to 5 percent

Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 2.6 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Shallow Sandy
Ecological Site Id: 042XD006NM
Present native vegetation: Mixed prairie type consisting of black grama, blue grama, vine mesquite, New Mexico feathergrass, sand muhly, winterfat, cholla, and yucca.
Land capability (nonirrigated): 7s
Typical Profile:
 A—0 to 3 inches; very fine sandy loam
 Bt—3 to 9 inches; sandy clay loam
 Bk—9 to 19 inches; gravelly loam
 Bkm—19 to 25 inches; petrocalcic
 2Bk—25 to 80 inches; gravelly silt loam
Depth to restrictive feature: 14 to 20 inches to petrocalcic

Estimated Minor Components

Armesa and similar soils
Composition: About 2 percent
Component Geomorphic Setting: Inset fan on fan piedmont
Slope: 1 to 5 percent
 Philder and similar soils
Composition: About 2 percent
Component Geomorphic Setting: Erosion remnant on fan piedmont
Slope: 2 to 5 percent
 Altuda and similar soils
Composition: About 1 percent
Component Geomorphic Setting: Hill
Slope: 5 to 15 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat (fig. 7)

For information about management, see the Use and Management section of this publication.

65—Armesa-Salado complex, 1 to 3 percent slopes

Map Unit Setting

Landform: Fan piedmont
Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)
Frost-free period: 140 to 180 days

Map Unit Composition

Armesa and similar soils: 70 percent
 Salado and similar soils: 20 percent
 Minor components: 10 percent

Properties and Qualities

Armesa soils

Taxonomic classification: Fine-loamy, carbonatic, thermic Ustic Haplocalcids
Geomorphic position: Inset fan on fan piedmont
Parent material: Eolian sands over calcareous upland alluvium derived from limestone
Slope: 1 to 3 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.5 inches (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Limy
Ecological Site Id: 042XD004NM
Present native vegetation: Mixed prairie type consisting of blue grama, black grama, sand muhly, threeawns, and yucca.
Land capability (nonirrigated): 6c
Typical Profile:
 A—0 to 3 inches; very fine sandy loam
 Bw—3 to 8 inches; sandy clay loam
 Bk1—8 to 14 inches; sandy clay loam
 Bk2—14 to 31 inches; silty clay loam
 Bk3—31 to 36 inches; gravelly silty clay loam

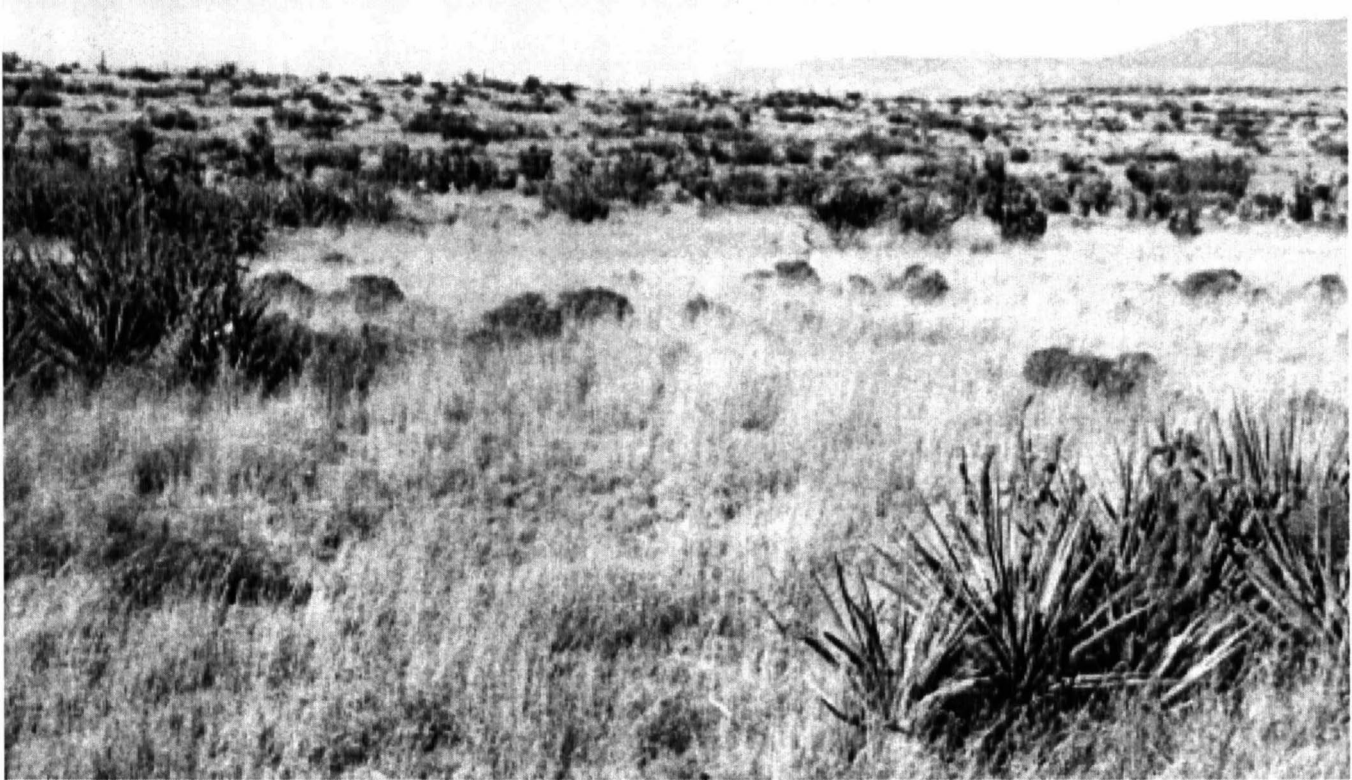


Figure 7.— An area of Jerag very fine sandy loam, 1 to 5 percent slopes, on Otero Mesa. This extensive unit has a petrocalcic horizon and is used primarily for livestock grazing.

Bk4—36 to 80 inches; gravelly sandy clay loam

Salado soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Ustic Haplocalcids

Geomorphic position: Fan piedmont

Parent material: Calcareous alluvium derived from limestone

Slope: 1 to 3 percent

Surface fragments: About 5 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 9.8 inches (high)

Flooding hazard: None

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 4 mmhos/cm (very slightly saline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Loamy

Ecological Site Id: 042XD001NM

Present native vegetation: Mixed prairie type consisting of blue grama, tobosa, vine mesquite, alkali sacaton, and sand muhly.

Land capability (nonirrigated): 6c

Typical Profile:

A1—0 to 1 inch; loam

A2—1 to 5 inches; loam

Bw—5 to 13 inches; silt loam

Bk1—13 to 27 inches; silt loam

Bk2—27 to 41 inches; loam

Bk3—41 to 70 inches; clay loam

Bk4—70 to 80 inches; sandy clay loam

Estimated Minor Components

Reyab and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 0 to 5 percent

Altuda and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Hill
Slope: 5 to 15 percent

Philder and similar soils

Composition: About 3 percent
Component Geomorphic Setting: Erosion remnant on fan piedmont
Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

66—Jerag-Armesa complex, 2 to 5 percent slopes

Map Unit Setting

Landform: Fan piedmont
Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)
Frost-free period: 140 to 180 days

Map Unit Composition

Jerag and similar soils: 50 percent
 Armesa and similar soils: 35 percent
 Minor components: 15 percent

Properties and Qualities

Jerag soils

Taxonomic classification: Loamy, mixed, superactive, thermic, shallow Ustalfic Petrocalcids
Geomorphic position: Fan piedmont
Parent material: Eolian sands over alluvium derived from limestone
Slope: 2 to 5 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 2.6 inches (very low)
Flooding hazard: None

Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Shallow Sandy
Ecological Site Id: 042XD006NM
Present native vegetation: Mixed prairie type consisting of black grama, blue grama, vine mesquite, New Mexico feathergrass, sand muhly, winterfat, cholla, and yucca.
Land capability (nonirrigated): 7s
Typical Profile:
 A—0 to 3 inches; very fine sandy loam
 Bt—3 to 9 inches; sandy clay loam
 Bk—9 to 19 inches; gravelly loam
 Bkm—19 to 25 inches; petrocalcic
 2Bk—25 to 80 inches; gravelly silt loam
Depth to restrictive feature: 14 to 20 inches to petrocalcic

Armesa soils

Taxonomic classification: Fine-loamy, carbonatic, thermic Ustic Haplocalcids
Geomorphic position: Inset fan on fan piedmont
Parent material: Eolian sands over calcareous upland alluvium derived from limestone
Slope: 2 to 5 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 9.5 inches (high)
Flooding hazard: None
Ponding hazard: None
Runoff class: Medium
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Limy
Ecological Site Id: 042XD004NM
Present native vegetation: Mixed prairie type consisting of blue grama, black grama, sand muhly, threeawns, and yucca.
Land capability (nonirrigated): 6c
Typical Profile:
 A—0 to 3 inches; very fine sandy loam
 Bw—3 to 8 inches; sandy clay loam
 Bk1—8 to 14 inches; sandy clay loam
 Bk2—14 to 31 inches; silty clay loam
 Bk3—31 to 36 inches; gravelly silty clay loam

Bk4—36 to 80 inches; gravelly sandy clay loam

Estimated Minor Components

Reyab and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 0 to 5 percent

Salado and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Fan piedmont

Slope: 1 to 3 percent

Altuda and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Hill

Slope: 5 to 15 percent

Philder and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

67—Oryx loam, 1 to 5 percent slopes

Map Unit Setting

Landform: Inset fan on fan piedmont

Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Oryx and similar soils: 90 percent

Minor components: 10 percent

Properties and Qualities

Oryx soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Ustic Torrfluvents

Geomorphic position: Inset fan on fan piedmont

Parent material: Calcareous alluvium derived from limestone

Slope: 1 to 5 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 5.4 inches (low)

Flooding hazard: Rare

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Draw

Ecological Site Id: 042XD003NM

Present native vegetation: Mixed prairie type

consisting of sideoats grama, blue grama, giant sacaton, alkali sacaton, desert willow, apache plume, brickellbush, mariola, creosotebush, and littleleaf sumac.

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 4 inches; loam

2C1—4 to 37 inches; extremely gravelly loam

3C2—37 to 55 inches; silt loam

3C3—55 to 80 inches; silt loam

Estimated Minor Components

Reyab and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 0 to 5 percent

Double and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Alluvial fan

Slope: 2 to 5 percent

Philder and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

68—Oryx-Reyab complex, 1 to 3 percent slopes

Map Unit Setting

Landform: Inset fan on fan piedmont

Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Oryx and similar soils: 65 percent

Reyab and similar soils: 25 percent

Minor components: 10 percent

Properties and Qualities

Oryx soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Ustic Torrifluvents

Geomorphic position: Inset fan on fan piedmont

Parent material: Calcareous alluvium derived from limestone

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 5.4 inches (low)

Flooding hazard: Rare

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Draw

Ecological Site Id: 042XD003NM

Present native vegetation: Mixed prairie type consisting of blue grama, sideoats grama, bush muhly, mariola, and creosotebush.

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 4 inches; loam

2C1—4 to 37 inches; extremely gravelly loam

3C2—37 to 55 inches; silt loam

3C3—55 to 80 inches; silt loam

Reyab soils

Taxonomic classification: Fine-silty, mixed, superactive, thermic Ustic Haplocambids

Geomorphic position: Inset fan on fan piedmont

Parent material: Alluvium derived from limestone

Slope: 1 to 3 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 9.4 inches (high)

Flooding hazard: Rare

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Loamy

Ecological Site Id: 042XD001NM

Present native vegetation: Mixed prairie type consisting of tobosa, burrograss, blue grama, tarbush, and creosotebush.

Land capability (nonirrigated): 6e

Typical Profile:

A—0 to 4 inches; loam

Bw1—4 to 12 inches; silt loam

Bw2—12 to 25 inches; silt loam

C—25 to 80 inches; silt loam

Estimated Minor Components

Double and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Alluvial fan

Slope: 2 to 5 percent

Philder and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Erosion remnant on fan piedmont

Slope: 2 to 5 percent

Bissett and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Hill

Slope: 5 to 15 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

69—Double silt loam, 2 to 5 percent slopes

Map Unit Setting

Landform: Alluvial fan

Elevation: 4,700 to 6,000 feet (1,433 to 1,829 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Double and similar soils: 90 percent

Minor components: 10 percent

Properties and Qualities

Double soils

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Ustic Haplocambids

Geomorphic position: Alluvial fan

Parent material: Calcareous alluvium derived from limestone

Slope: 2 to 5 percent

Surface fragments: About 1 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 10.1 inches (high)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Clay Loam Upland

Ecological Site Id: 042XD005NM

Present native vegetation: Mixed prairie type

consisting of alkali sacaton, blue grama, tobosa, threeawns, and yucca (fig. 8).

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 2 inches; silt loam

Bw1—2 to 8 inches; silt loam

Bw2—8 to 37 inches; clay loam

Bw3—37 to 80 inches; loam

Estimated Minor Components

Salado and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 3 percent

Oryx and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 5 percent

Reyab and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.



Fig. 8.—Alkali sacaton in an area of Double silt loam, 2 to 5 percent slopes, on Otero Mesa.

70—Stealth loamy fine sand, 2 to 5 percent slopes

Map Unit Setting

Landform: Fan piedmont
Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 140 to 180 days

Map Unit Composition

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

Properties and Qualities

Stealth soils

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Arenic Ustic Calciargids
Geomorphic position: Inset fan on fan piedmont
Parent material: Eolian sands over alluvium
Slope: 2 to 5 percent
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 6.9 inches (moderate)
Flooding hazard: None
Ponding hazard: None
Runoff class: Low
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Loamy Sand
Ecological Site Id: 042XD008NM
Present native vegetation: Desert grassland type consisting of black grama, sand dropseed, threeawns, sand sagebrush, southwest rabbitbrush, and yucca.
Land capability (nonirrigated): 6c
Typical Profile:
 A—0 to 6 inches; loamy fine sand
 Bw—6 to 21 inches; loamy fine sand
 Bt—21 to 30 inches; fine sandy loam
 2Bk1—30 to 46 inches; loam
 3Bk2—46 to 80 inches; sandy loam

Estimated Minor Components

Jerag and similar soils
Composition: About 4 percent
Component Geomorphic Setting: Fan piedmont

Slope: 1 to 3 percent

Reyab and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 3 percent

Aguena and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Dune

Slope: 1 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

72—Yippin loamy sand, 2 to 5 percent slopes

Map Unit Setting

Landform: Erosion remnant on fan piedmont

Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)

Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)

Frost-free period: 200 to 240 days

Map Unit Composition

Yippin and similar soils: 100 percent

Properties and Qualities

Yippin soils

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic Haplocalcids

Geomorphic position: Erosion remnant on fan piedmont

Parent material: Alluvium derived from igneous rock

Slope: 2 to 5 percent

Surface fragments: About 1 percent gravel

Drainage class: Well drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 5.8 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Sandy

Ecological Site Id: 042XB012NM

Present native vegetation: Desert shrub type consisting of mesquite, creosotebush, desert zinnia, and soaptree yucca.

Land capability (nonirrigated): 7c

Typical Profile:

A—0 to 2 inches; loamy sand

Bw1—2 to 5 inches; loamy sand

Bw2—5 to 15 inches; sandy loam

Bk1—15 to 31 inches; sandy loam

Bk2—31 to 45 inches; sandy loam

C—45 to 80 inches; sandy loam

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

73—Aguena fine sand, 5 to 15 percent slopes

Map Unit Setting

Landform: Dune on hill (fig. 9)

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

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

Properties and Qualities**Aguena soils**

Taxonomic classification: Mixed, thermic Ustic
Torripsamments
Geomorphic position: Dune on hill

Parent material: Eolian sands

Slope: 5 to 15 percent

Drainage class: Excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 4.1 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)



Figure 9.—An area of Aguena fine sand, 5 to 15 percent slopes, in the foreground. Aguena fine sand, 15 to 35 percent slopes, is in the background. This unit occurs as climbing dunes overlying limestone bedrock.

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Deep Sand

Ecological Site Id: 042XC005NM

Present native vegetation: Desert grassland type consisting of giant dropseed, mesa dropseed, bush muhly, sand dropseed, desert marigold, sand sagebrush, mesquite, fourwing saltbush, broom snakeweed, and yucca elata.

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 7 inches; fine sand

C—7 to 80 inches; fine sand

Estimated Minor Components

Bissett and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Hill

Slope: 5 to 35 percent

Rock outcrop

Composition: About 4 percent

Component Geomorphic Setting: Hill

Copia and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Dune

Slope: 5 to 15 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

74—Aguena fine sand, 15 to 35 percent slopes

Map Unit Setting

Landform: Dune on hill

Elevation: 4,200 to 5,300 feet (1,281 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Aguena and similar soils: 90 percent

Minor components: 10 percent

Properties and Qualities

Aguena soils

Taxonomic classification: Mixed, thermic Ustic Torripsamments

Geomorphic position: Dune on hill

Parent material: Eolian sands

Slope: 15 to 35 percent

Drainage class: Excessively drained

Permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity: About 4.1 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Sandhills

Ecological Site Id: 042XC022NM

Present native vegetation: Desert grassland type consisting of giant dropseed, mesa dropseed, sand dropseed, Indian ricegrass, shin oak, desert marigold, hoary rosemary mint, sand sagebrush, mesquite, fourwing saltbush, broom snakeweed, and yucca elata.

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 7 inches; fine sand

C—7 to 80 inches; fine sand

Estimated Minor Components

Rock outcrop

Composition: About 6 percent

Component Geomorphic Setting: Hill

Copia and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Dune

Slope: 5 to 15 percent

Bissett and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Hill

Slope: 5 to 35 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils"

in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

75—Deama-Rock outcrop complex, 5 to 15 percent slopes

Map Unit Setting

Landform: Hill

Elevation: 5,500 to 6,800 feet (1,677 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 58 degrees F (12.2 to 14.4 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Deama and similar soils: 50 percent

Rock outcrop: 35 percent

Minor components: 15 percent

Properties and Qualities

Deama soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Lithic Calciustolls

Geomorphic position: Hill

Parent material: Colluvium derived from limestone

Slope: 5 to 15 percent

Surface fragments: About 25 percent gravel, about 25 percent cobbles, about 5 percent stones

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.3 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Limestone Hills

Ecological Site Id: 070XD151NM

Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, muhly species, and mountainmahogany.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 6 inches; very cobbly loam

Bk—6 to 16 inches; very cobbly loam

R—16 to 80 inches; bedrock

Depth to restrictive feature: 7 to 20 inches to bedrock (lithic)

Rock outcrop

Geomorphic position: Hill

Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Altuda and similar soils

Composition: About 8 percent

Component Geomorphic Setting: Hill

Slope: 5 to 15 percent

Penalto and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Hill

Slope: 5 to 15 percent

Cale and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Valley

Slope: 2 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

76—Deama-Rock outcrop complex, 15 to 35 percent slopes

Map Unit Setting

Landform: Hill

Elevation: 5,500 to 6,800 feet (1,677 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 58 degrees F (12.2 to 14.4 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Deama and similar soils: 50 percent

Rock outcrop: 35 percent

Minor components: 15 percent

Properties and Qualities

Deama soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Lithic Calciustolls

Geomorphic position: Hill

Parent material: Colluvium derived from limestone

Slope: 15 to 35 percent

Surface fragments: About 25 percent gravel, about 25 percent cobbles, about 5 percent stones

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.3 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Limestone Hills

Ecological Site Id: 070XD151NM

Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, muhly species, and mountainmahogany.

Land capability (nonirrigated): 7e

Typical Profile:

A—0 to 6 inches; very cobbly loam

Bk—6 to 16 inches; very cobbly loam

R—16 to 80 inches; bedrock

Depth to restrictive feature: 7 to 20 inches to bedrock (lithic)

Rock outcrop

Geomorphic position: Hill

Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Altuda and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Hill

Slope: 15 to 35 percent

Penalto and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Hill

Slope: 15 to 35 percent

Modeama and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Hill

Slope: 15 to 35 percent

Cale and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Valley

Slope: 3 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat
For information about management, see the Use and Management section of this publication.

77—Deama-Rock outcrop complex, 35 to 65 percent slopes

Map Unit Setting

Landform: Hill
Elevation: 5,500 to 6,800 feet (1,677 to 2,073 meters)
Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)
Average annual air temperature: 54 to 58 degrees F (12.2 to 14.4 degrees C)
Frost-free period: 130 to 170 days

Map Unit Composition

Deama and similar soils: 60 percent
Rock outcrop: 35 percent
Minor components: 5 percent

Properties and Qualities

Deama soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Lithic Calciustolls
Geomorphic position: Hill
Parent material: Colluvium derived from limestone
Slope: 35 to 65 percent
Surface fragments: About 25 percent gravel, about 25 percent cobbles, about 5 percent stones
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 1.3 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70
Ecological Site: Limestone Hills
Ecological Site Id: 070XD151NM
Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, muhly species, mountainmahogany, and a few scattered pinyon and juniper.
Land capability (nonirrigated): 7e
Typical Profile:
A—0 to 6 inches; very cobbly loam

Bk—6 to 16 inches; very cobbly loam

R—16 to 80 inches; bedrock

Depth to restrictive feature: 7 to 20 inches to bedrock (lithic)

Rock outcrop

Geomorphic position: Hill

Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Penalto and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Hill

Slope: 35 to 65 percent

Altuda and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Hill

Slope: 35 to 65 percent

Cale and similar soils

Composition: About 1 percent

Component Geomorphic Setting: Valley

Slope: 3 to 5 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

78—Deama-Penalto-Rock outcrop complex, 5 to 15 percent slopes

Map Unit Setting

Landform: Hill
Elevation: 6,000 to 6,800 feet (1,829 to 2,073 meters)
Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 58 degrees F
(12.2 to 14.4 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Deama and similar soils: 40 percent

Penalto and similar soils: 30 percent

Rock outcrop: 20 percent

Minor components: 10 percent

Properties and Qualities

Deama soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Lithic Calciustolls

Geomorphic position: Hill

Parent material: Colluvium derived from limestone

Slope: 5 to 15 percent

Surface fragments: About 25 percent gravel, about 25 percent cobbles, about 5 percent stones

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 0.9 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Limestone Hills

Ecological Site Id: 070XD151NM

Present native vegetation: Pinyon Juniper savannah type consisting of sideoats grama, blue grama, muhly species, alligator juniper, and pinyon

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 2 inches; very cobbly loam

Bk1—2 to 8 inches; very cobbly loam

Bk2—8 to 11 inches; very cobbly loam

R—11 to 80 inches; bedrock

Depth to restrictive feature: 7 to 20 inches to bedrock (lithic)

Penalto soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic, shallow Petrocalcic Calciustolls

Geomorphic position: Hill

Parent material: Gravelly alluvium derived from limestone

Slope: 5 to 15 percent

Surface fragments: About 15 percent cobbles, about 25 percent gravel

Drainage class: Well drained

Permeability: 0.6 to 2.0 in/hr (moderate)

Available water capacity: About 1.3 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Limestone Hills

Ecological Site Id: 070XD151NM

Present native vegetation: Pinyon juniper savannah type consisting of sideoats grama, blue grama, wolftail, muhly species, alligator juniper, pinyon, and oak (fig. 10).

Land capability (nonirrigated): 7s

Typical Profile:

Ak1—0 to 6 inches; very gravelly loam

Ak2—6 to 16 inches; very gravelly loam

Bkm1—16 to 20 inches; very gravelly petrocalcic

Bkm2—20 to 39 inches; very gravelly petrocalcic

Bkm3—39 to 80 inches; very gravelly petrocalcic

Depth to restrictive feature: 10 to 20 inches to petrocalcic

Rock outcrop

Geomorphic position: Hill

Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Cale and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Valley

Slope: 1 to 4 percent

Modeama and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Hill

Slope: 5 to 15 percent

Penagua and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Hill

Slope: 5 to 15 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication.

Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat
For information about management, see the Use and Management section of this publication.

79—Deama-Penalto-Rock outcrop complex, 15 to 35 percent slopes

Map Unit Setting

Landform: Hill
Elevation: 6,000 to 6,800 feet (1,829 to 2,073 meters)
Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)
Average annual air temperature: 54 to 58 degrees F (12.2 to 14.4 degrees C)
Frost-free period: 130 to 170 days

Map Unit Composition

Deama and similar soils: 45 percent
Penalto and similar soils: 35 percent
Rock outcrop: 15 percent
Minor components: 5 percent

Properties and Qualities

Deama soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Lithic Calciustolls
Geomorphic position: Hill
Parent material: Colluvium derived from limestone
Slope: 15 to 35 percent
Surface fragments: About 25 percent gravel, about 25 percent cobbles, about 5 percent stones
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 0.9 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70
Ecological Site: Limestone Hills

Ecological Site Id: 070XD151NM

Present native vegetation: Pinyon Juniper savannah type consisting of sideoats grama, blue grama, muhly species, alligator juniper, and pinyon.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 2 inches; very cobbly loam
Bk1—2 to 8 inches; very cobbly loam
Bk2—8 to 11 inches; very cobbly loam
R—11 to 80 inches; bedrock

Depth to restrictive feature: 7 to 20 inches to bedrock (lithic)

Penalto soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic, shallow Petrocalcic Calciustolls
Geomorphic position: Hill
Parent material: Gravelly alluvium derived from limestone
Slope: 15 to 35 percent
Surface fragments: About 15 percent cobbles, about 25 percent gravel
Drainage class: Well drained
Permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity: About 1.3 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70
Ecological Site: Limestone Hills
Ecological Site Id: 070XD151NM
Present native vegetation: Pinyon juniper savannah type consisting of sideoats grama, blue grama, wolftail, muhly species, alligator juniper, pinyon, and oak.

Land capability (nonirrigated): 7s

Typical Profile:

Ak1—0 to 6 inches; very gravelly loam
Ak2—6 to 16 inches; very gravelly loam
Bkm1—16 to 20 inches; very gravelly petrocalcic
Bkm2—20 to 39 inches; very gravelly petrocalcic
Bkm3—39 to 80 inches; very gravelly petrocalcic

Depth to restrictive feature: 10 to 20 inches to petrocalcic

Rock outcrop

Geomorphic position: Hill

Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Cale and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Valley

Slope: 1 to 5 percent

Modeama and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Hill

Slope: 15 to 35 percent

Penagua and similar soils

Composition: About 1 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

80—Deama-Penalto-Rock outcrop complex, 35 to 65 percent slopes

Map Unit Setting

Landform: Hill

Elevation: 6,000 to 6,800 feet (1,829 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 58 degrees F (12.2 to 14.4 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Deama and similar soils: 40 percent

Penalto and similar soils: 35 percent

Rock outcrop: 25 percent

Properties and Qualities

Deama soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Lithic Calciustolls

Geomorphic position: Hill

Parent material: Colluvium derived from limestone

Slope: 35 to 65 percent

Surface fragments: About 25 percent gravel, about 25 percent cobbles, about 5 percent stones

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 0.9 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Limestone Hills

Ecological Site Id: 070XD151NM

Present native vegetation: Pinyon Juniper savannah type consisting of sideoats grama, blue grama, muhly species, alligator juniper, and pinyon.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 2 inches; very cobbly loam

Bk1—2 to 8 inches; very cobbly loam

Bk2—8 to 11 inches; very cobbly loam

R—11 to 80 inches; bedrock

Depth to restrictive feature: 7 to 20 inches to bedrock (lithic)

Penalto soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic, shallow Petrocalcic Calciustolls

Geomorphic position: Hill

Parent material: Gravelly alluvium derived from limestone

Slope: 35 to 65 percent

Surface fragments: About 15 percent cobbles, about 25 percent gravel

Drainage class: Well drained

Permeability: 0.6 to 2.0 in/hr (moderate)

Available water capacity: About 1.3 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Limestone Hills

Ecological Site Id: 070XD151NM

Present native vegetation: Pinyon juniper savannah type consisting of sideoats grama, blue grama, wolftail, muhly species, alligator juniper, pinyon, and oak.

Land capability (nonirrigated): 7s

Typical Profile:

Ak1—0 to 6 inches; very gravelly loam

Ak2—6 to 16 inches; very gravelly loam

Bkm1—16 to 20 inches; very gravelly petrocalcic

Bkm2—20 to 39 inches; very gravelly petrocalcic

Bkm3—39 to 80 inches; very gravelly petrocalcic

Depth to restrictive feature: 10 to 20 inches to petrocalcic

Rock outcrop

Geomorphic position: Hill

Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

81—Cale silt loam, 2 to 5 percent slopes

Map Unit Setting

Landform: Valley

Elevation: 5,500 to 6,800 feet (1,677 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 58 degrees F (12.2 to 14.4 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Cale and similar soils: 100 percent

Properties and Qualities

Cale soils

Taxonomic classification: Fine-silty, mixed, superactive, mesic Aridic Argiustolls

Geomorphic position: Valley

Parent material: Alluvium derived from limestone

Slope: 2 to 5 percent

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 10.8 inches (high)

Flooding hazard: Rare

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Loamy

Ecological Site Id: 070XD153NM

Present native vegetation: Pinyon juniper savannah type consisting of blue grama, sideoats grama, vine mesquite, globemallow, alligator juniper, skunkbush sumac, and yucca.

Land capability (nonirrigated): 6e

Typical Profile:

A1—0 to 2 inches; silt loam

A2—2 to 8 inches; silt loam

Btk1—8 to 13 inches; silty clay loam

Btk2—13 to 19 inches; silty clay loam

Btk3—19 to 30 inches; silty clay loam

Btk4—30 to 52 inches; silty clay loam

Bk—52 to 80 inches; silt loam

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

82—Modeama-Rock outcrop complex, 5 to 15 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 6,500 to 7,650 feet (1,982 to 2,332 meters)

Mean annual precipitation: 16 to 18 inches (406 to 457 millimeters)

Average annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)

Frost-free period: 120 to 160 days

Map Unit Composition

Modeama and similar soils: 55 percent

Rock outcrop: 40 percent

Minor components: 5 percent

Properties and Qualities

Modeama soils

Taxonomic classification: Clayey-skeletal, mixed, superactive, mesic Typic Argiustolls

Geomorphic position: Hill

Parent material: Colluvium derived from limestone

Slope: 5 to 15 percent

Surface fragments: About 20 percent gravel, about 50 percent cobbles, about 1 percent stones

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.8 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Woodland conifer type consisting of sideoats grama, muhly species, pinyon ricegrass, wolftail, alligator juniper, pinyon, algerita, and mountainmahogany.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 4 inches; extremely cobbly silt loam

Btk—4 to 14 inches; extremely cobbly silty clay

Bk—14 to 33 inches; extremely cobbly loam

R—33 to 80 inches; bedrock

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

Rock outcrop

Geomorphic position: Hill

Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Penagua and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Hill

Slope: 5 to 15 percent

Deama and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Hill

Slope: 5 to 15 percent

Penalto and similar soils

Composition: About 1 percent

Component Geomorphic Setting: Hill

Slope: 5 to 15 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

83—Penagua-Modeama-Rock outcrop complex, 15 to 35 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 6,500 to 7,650 feet (1,982 to 2,332 meters)

Mean annual precipitation: 16 to 18 inches (406 to 457 millimeters)

Average annual air temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)

Frost-free period: 120 to 160 days

Map Unit Composition

Penagua and similar soils: 45 percent

Modeama and similar soils: 35 percent

Rock outcrop: 20 percent

Properties and Qualities

Penagua soils

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Typic Calciustolls

Geomorphic position: Mountain

Parent material: Colluvium derived from limestone

Slope: 15 to 35 percent

Surface fragments: About 25 percent cobbles, about 30 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 5.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Woodland conifer type consisting of sideoats grama, muhly species, pinyon ricegrass, needlegrass, oak, alligator juniper, pinyon, mountainmahogany, and sacahuista.

Land capability (nonirrigated): 7e

Typical Profile:

Ak1—0 to 6 inches; very cobbly silt loam

Ak2—6 to 11 inches; very cobbly silt loam

Bk1—11 to 26 inches; very cobbly silt loam

Bk2—26 to 33 inches; very cobbly silt loam

Bk3—33 to 46 inches; very cobbly silt loam

Bk4—46 to 80 inches; very gravelly silt loam

Modeama soils

Taxonomic classification: Clayey-skeletal, mixed, superactive, mesic Typic Argiustolls

Geomorphic position: Mountain

Parent material: Colluvium derived from limestone

Slope: 15 to 35 percent

Surface fragments: About 20 percent gravel, about 50 percent cobbles, about 1 percent stones

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.8 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: woodland conifer type consisting of sideoats grama, muhly species, pinyon ricegrass, wolftail, alligator juniper, pinyon, algerita, and mountainmahogany.

Land capability (nonirrigated): 7e

Typical Profile:

A—0 to 4 inches; extremely cobbly silt loam

Btk—4 to 14 inches; extremely cobbly silty clay

Bk—14 to 33 inches; extremely cobbly loam

R—33 to 80 inches; bedrock

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

Rock outcrop

Geomorphic position: Hill

Parent material: Thickly bedded massive limestone

Interpretive Groups

Major Land Resource Area: 70

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

91—Miscellaneous Water

These areas are covered with water in most years.

92—Pits

Pits are open excavations from which soil and commonly underlying material have been removed, exposing either rock or other material.

93—Dumps

Dumps are areas of smoothed or uneven accumulations or piles of general refuse and thin layers of soil material.

94—Delnorte-Canutio complex, 3 to 8 percent slopes

Map Unit Setting

Landform: Fan piedmont
Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)
Frost-free period: 200 to 240 days

Map Unit Composition

Delnorte and similar soils: 55 percent
 Canutio and similar soils: 35 percent
 Minor components: 10 percent

Properties and Qualities

Delnorte soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic, shallow Calcic Petrocalcids
Geomorphic position: Fan piedmont
Parent material: Gravelly alluvium
Slope: 3 to 8 percent
Surface fragments: About 50 percent gravel
Drainage class: Well drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 0.8 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly
Ecological Site Id: 042XB010NM
Present native vegetation: Desert shrub type consisting of bush muhly, tridens, fluffgrass, creosotebush, ocotillo, and lechuguilla.
Land capability (nonirrigated): 7s
Typical Profile:
 Ak—0 to 8 inches; very gravelly loam
 Bk—8 to 12 inches; extremely gravelly loam
 Bkm—12 to 20 inches; petrocalcic
 BCk—20 to 80 inches; extremely gravelly fine sand
Depth to restrictive feature: 6 to 20 inches to petrocalcic

Canutio soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, thermic Typic Torriorthents
Geomorphic position: Fan piedmont
Parent material: Gravelly alluvium
Slope: 3 to 8 percent
Surface fragments: About 20 percent gravel, about 10 percent cobbles, about 1 percent stones
Drainage class: Well drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 2.7 inches (very low)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: Low
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly Sand
Ecological Site Id: 042XB024NM
Present native vegetation: Desert shrub type consisting of bush muhly, tridens, fluffgrass, creosotebush, ocotillo, and lechuguilla.
Land capability (nonirrigated): 7s
Typical Profile:
 Ak—0 to 11 inches; gravelly sandy loam
 BCk—11 to 80 inches; extremely gravelly sandy loam

Estimated Minor Components

Brewster and similar soils
Composition: About 5 percent

Component Geomorphic Setting: Mountain
Slope: 35 to 65 percent

Missile and similar soils

Composition: About 3 percent
Component Geomorphic Setting: Fan piedmont
Slope: 3 to 15 percent

Rock outcrop

Composition: About 2 percent
Component Geomorphic Setting: Mountain

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: military post

For information about management, see the Use and Management section of this publication.

95—Delnorte-Canutio complex, 8 to 15 percent slopes

Map Unit Setting

Landform: Fan piedmont
Elevation: 3,900 to 4,200 feet (1,189 to 1,281 meters)
Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Average annual air temperature: 62 to 66 degrees F (16.7 to 18.9 degrees C)
Frost-free period: 200 to 240 days

Map Unit Composition

Delnorte and similar soils: 55 percent
 Canutio and similar soils: 35 percent
 Minor components: 10 percent

Properties and Qualities

Delnorte soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic, shallow Calcic Petrocalcids
Geomorphic position: Fan piedmont
Parent material: Gravelly alluvium
Slope: 8 to 15 percent
Surface fragments: About 50 percent gravel

Drainage class: Well drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 0.8 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly
Ecological Site Id: 042XB010NM
Present native vegetation: Desert shrub type consisting of bush muhly, tridens, fluffgrass, creosotebush, ocotillo, and lechuguilla.
Land capability (nonirrigated): 7s
Typical Profile:
 Ak—0 to 8 inches; very gravelly loam
 Bk—8 to 12 inches; extremely gravelly loam
 Bkm—12 to 20 inches; petrocalcic
 BCk—20 to 80 inches; extremely gravelly fine sand
Depth to restrictive feature: 6 to 20 inches to petrocalcic

Canutio soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, thermic Typic Torriorthents
Geomorphic position: Fan piedmont
Parent material: Gravelly alluvium
Slope: 8 to 15 percent
Surface fragments: About 20 percent gravel, about 10 percent cobbles, about 1 percent stones
Drainage class: Well drained
Permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity: About 2.7 inches (very low)
Flooding hazard: Rare
Ponding hazard: None
Runoff class: Low
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Gravelly Sand
Ecological Site Id: 042XB024NM
Present native vegetation: Desert shrub type consisting of bush muhly, tridens, fluffgrass, creosotebush, ocotillo, and lechuguilla.

Land capability (nonirrigated): 7s

Typical Profile:

Ak—0 to 11 inches; gravelly sandy loam

BCK—11 to 80 inches; extremely gravelly sandy loam

Estimated Minor Components

Brewster and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Hill

Slope: 35 to 65 percent

Rock outcrop

Composition: About 3 percent

Component Geomorphic Setting: Mountain

Missile and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Fan piedmont

Slope: 5 to 15 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: military post

For information about management, see the Use and Management section of this publication.

105—Stallone extremely bouldery sandy loam, 5 to 15 percent slopes

Map Unit Setting

Landform: Alluvial fan

Elevation: 4,500 to 5,500 feet (1,372 to 1,677 meters)

Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Stallone and similar soils: 95 percent

Minor components: 5 percent

Properties and Qualities

Stallone soils

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

Geomorphic position: Alluvial fan

Parent material: Debris flow deposits derived from monzonite

Slope: 5 to 15 percent

Surface fragments: About 25 percent boulders, about 20 percent cobbles, about 40 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.7 inches (very low)

Flooding hazard: Very Rare

Ponding hazard: None

Runoff class: High

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Foothill Slope (Mixed Prairie)

Ecological Site Id: 042XY274TX

Present native vegetation: Mixed prairie type consisting of black grama, sideoats grama, tanglehead, plains bristlegrass, green sprangletop, mesquite, and Torrey's yucca.

Land capability (nonirrigated): 7s

Typical Profile:

A—0 to 2 inches; extremely bouldery sandy loam

Bw—2 to 8 inches; extremely cobbly sandy loam

C1—8 to 14 inches; extremely cobbly sandy clay loam

C2—14 to 34 inches; extremely cobbly sandy clay loam

C3—34 to 80 inches; extremely cobbly sandy clay loam

Estimated Minor Components

Brewster and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Rock outcrop and similar soils

Composition: About 1 percent

Component Geomorphic Setting: Mountain

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

106—Chuzzie very gravelly loam, 0 to 3 percent slopes

Map Unit Setting

Landform: Stream terrace

Elevation: 4,700 to 6,300 feet (1,433 to 1,921 meters)

Mean annual precipitation: 13 to 15 inches (330 to 381 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Chuzzie and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Chuzzie soils

Taxonomic classification: Loamy-skeletal over sandy or sandy-skeletal, mixed, superactive, thermic Pachic Haplustolls

Geomorphic position: Stream terrace

Parent material: Alluvium derived from monzonite and/or alluvium derived from tuff

Slope: 0 to 3 percent

Surface fragments: About 5 percent cobbles, about 50 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 2.8 inches (very low)

Flooding hazard: Very Rare

Ponding hazard: None

Runoff class: Medium

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Draw (Mixed Prairie)

Ecological Site Id: 042XY273TX

Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, Apache plume, oak species, and alligator juniper.

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 2 inches; very gravelly loam

C1—2 to 8 inches; very gravelly loam

C2—8 to 16 inches; very gravelly loam

2C3—16 to 34 inches; extremely gravelly loamy sand

2C4—34 to 80 inches; extremely gravelly sand

Estimated Minor Components

Poblano and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 5 to 15 percent

Sotol and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Stallone and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Alluvial fan

Slope: 5 to 15 percent

Rock outcrop

Composition: About 2 percent

Component Geomorphic Setting: Mountain

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

107—Chipotle extremely gravelly sandy clay loam, 0 to 3 percent slopes

Map Unit Setting

Landform: Inset fan on fan piedmont
Elevation: 5,000 to 5,700 feet (1,525 to 1,738 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Chipotle and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities

Chipotle soils

Taxonomic classification: Sandy-skeletal, mixed, thermic Ustic Torrifluvents
Geomorphic position: Inset fan on fan piedmont
Parent material: Alluvium derived from tuff
Slope: 0 to 3 percent
Surface fragments: About 60 percent gravel, about 10 percent cobbles
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 3.0 inches (very low)
Flooding hazard: Very Rare
Ponding hazard: None
Runoff class: Medium
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Draw (Desert Grassland)
Ecological Site Id: 042XY242TX
Present native vegetation: Desert grassland type consisting of sideoats grama, black grama, Apache plume, mesquite, catclaw acacia, and desert willow.
Land capability (nonirrigated): 7s
Typical Profile:
 A—0 to 4 inches; extremely gravelly sandy clay loam
 2C1—4 to 17 inches; extremely gravelly sandy loam
 3C2—17 to 52 inches; extremely gravelly sand
 4C3—52 to 64 inches; very cobbly sandy clay loam

5C4—64 to 80 inches; extremely gravelly sandy loam

Estimated Minor Components

Crotalus and similar soils
Composition: About 9 percent
Component Geomorphic Setting: Mountain
Slope: 15 to 35 percent
 Missile and similar soils
Composition: About 6 percent
Component Geomorphic Setting: Fan piedmont
Slope: 5 to 15 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

111—Sotol gravelly loam, 15 to 35 percent slopes

Map Unit Setting

Landform: Mountain
Elevation: 4,700 to 6,300 feet (1,433 to 1,921 meters)
Mean annual precipitation: 13 to 15 inches (330 to 381 millimeters)
Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)
Frost-free period: 140 to 180 days

Map Unit Composition

Sotol and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities

Sotol soils

Taxonomic classification: Clayey-skeletal, mixed, superactive, thermic Aridic Argiustolls
Geomorphic position: Mountain
Parent material: Colluvium derived from monzonite
Slope: 15 to 35 percent

Surface fragments: About 20 percent gravel, about 5 percent cobbles

Drainage class: Well drained

Permeability: .001 to .06 in/hr (very slow)

Available water capacity: About 3.2 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Hills

Ecological Site Id: 042XE002NM

Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, green sprangletop, hairy grama, sotol, catclaw acacia, broom snakeweed, a few scattered alligator juniper, and shrub live-oak.

Land capability (nonirrigated): 6c

Typical Profile:

A—0 to 3 inches; gravelly loam

Bt1—3 to 8 inches; very gravelly clay loam

Bt2—8 to 18 inches; very gravelly clay

C—18 to 32 inches; very gravelly clay

Cr—32 to 38 inches; bedrock

R—38 to 80 inches; bedrock

Depth to restrictive feature: 18 to 38 inches to bedrock (paralithic); 20 to 40 inches to bedrock (lithic)

Estimated Minor Components

Brewster and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Crotalus and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Reduff and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Chuzzie and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Stream terrace

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil

Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

112—Brewster very gravelly loam, 35 to 65 percent slopes

Map Unit Setting

Landform: Hill and mountain

Elevation: 4,700 to 6,300 feet (1,433 to 1,921 meters)

Mean annual precipitation: 13 to 15 inches (330 to 381 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Brewster and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Brewster soils

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

Geomorphic position: Mountain

Parent material: Colluvium derived from monzonite

Slope: 35 to 65 percent

Surface fragments: About 20 percent cobbles, about 40 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 0.5 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Hills

Ecological Site Id: 042XE002NM

Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, black grama, bluestems, muhly, threeawns, lovegrass, acacia, silktassel, sotol, juniper, and shrub oak.

Land capability (nonirrigated): 7e

Typical Profile:

A1—0 to 4 inches; extremely gravelly loam

A2—4 to 8 inches; extremely gravelly loam

R—8 to 80 inches; bedrock

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

Estimated Minor Components

Sotol and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Rock outcrop

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Chuzzie and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Stream terrace

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: livestock grazing, wildlife habitat

For information about management, see the Use and Management section of this publication.

113—Rock outcrop-Brewster complex, 65 to 90 percent slopes

Map Unit Setting

Landform: Hill and mountain

Elevation: 4,700 to 6,300 feet (1,433 to 1,921 meters)

Mean annual precipitation: 13 to 15 inches (330 to 381 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Rock outcrop: 50 percent

Brewster and similar soils: 40 percent

Minor components: 10 percent

Properties and Qualities

Rock outcrop

Geomorphic position: Mountain

Parent material: Thickly bedded massive monzonite

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Brewster soils

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

Geomorphic position: Mountain Hill

Parent material: Colluvium derived from monzonite

Slope: 65 to 90 percent

Surface fragments: About 20 percent cobbles, about 40 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 0.5 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Hills

Ecological Site Id: 042XE002NM

Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, black grama, bluestems, muhlys, threeawns, lovegrass, acacia, silktassel, sotol, juniper, pinyon, and shrub oak.

Land capability (nonirrigated): 8e

Typical Profile:

A1—0 to 4 inches; extremely gravelly loam

A2—4 to 8 inches; extremely gravelly loam

R—8 to 80 inches; bedrock

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

Estimated Minor Components

Rotagilla and similar soils

Composition: About 8 percent

Component Geomorphic Setting: Mountain
Slope: 65 to 90 percent

Chuzzie and similar soils

Composition: About 2 percent
Component Geomorphic Setting: Stream terrace
Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

114—Brewster very bouldery loam, 35 to 65 percent slopes

Map Unit Setting

Landform: Hill and mountain
Elevation: 4,700 to 6,300 feet (1,433 to 1,921 meters)
Mean annual precipitation: 13 to 15 inches (330 to 381 millimeters)
Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)
Frost-free period: 140 to 180 days

Map Unit Composition

Brewster and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities

Brewster soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Lithic Haplustolls
Geomorphic position: Mountain Hill
Parent material: Colluvium derived from monzonite
Slope: 35 to 65 percent
Surface fragments: About 20 percent cobbles, about 40 percent gravel

Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 0.5 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Igneous Hills
Ecological Site Id: 042XE002NM
Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, black grama, bluestems, muhlys, threeawns, lovegrass, acacia, silktassel, sotol, juniper, and shrub oak.
Land capability (nonirrigated): 7e
Typical Profile:
 A1—0 to 4 inches; extremely gravelly loam
 A2—4 to 8 inches; extremely gravelly loam
 R—8 to 80 inches; bedrock
Depth to restrictive feature: 4 to 20 inches to bedrock (lithic)

Estimated Minor Components

Rotagilla and similar soils
Composition: About 7 percent
Component Geomorphic Setting: Mountain
Slope: 35 to 65 percent
 Rock outcrop and similar soils
Composition: About 6 percent
Component Geomorphic Setting: Mountain
 Chuzzie and similar soils
Composition: About 2 percent
Component Geomorphic Setting: Stream terrace
Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

120—Poblano very gravelly clay loam, 5 to 15 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 5,800 to 6,800 feet (1,768 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Poblano and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Poblano soils

Taxonomic classification: Clayey-skeletal, mixed, superactive, mesic Pachic Argiustolls

Geomorphic position: Mountain

Parent material: Alluvium and/or colluvium derived from monzonite

Slope: 5 to 15 percent

Surface fragments: About 10 percent boulders, about 10 percent stones, about 15 percent cobbles, about 20 percent gravel

Drainage class: Well drained

Permeability: .06 to 0.2 in/hr (slow)

Available water capacity: About 3.3 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Mountains

Ecological Site Id: 042XF001NM

Present native vegetation: Mountain savannah type consisting of sideoats grama, blue grama, bull muhly, metcalf muhly, wolftail, oaks, alligator juniper, and pinyon.

Land capability (nonirrigated): 6s

Typical Profile:

A—0 to 2 inches; very gravelly clay loam

Bt1—2 to 6 inches; very gravelly clay

Bt2—6 to 11 inches; very cobbly clay

Bt3—11 to 27 inches; very gravelly clay

Btk—27 to 34 inches; gravelly clay

Crk—34 to 42 inches; bedrock

R—42 to 80 inches; bedrock

Depth to restrictive feature: 30 to 40 inches to bedrock (paralithic); 40 to 60 inches to bedrock (lithic)

Estimated Minor Components

Sotol and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Rotagilla and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Thaad and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Chuzzie and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Stream terrace

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

121—Poblano very gravelly clay loam, 15 to 35 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 5,800 to 6,800 feet (1,768 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Poblano and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities**Poblano soils**

Taxonomic classification: Clayey-skeletal, mixed, superactive, mesic Pachic Argiustolls
Geomorphic position: Mountain
Parent material: Alluvium and/or colluvium derived from monzonite
Slope: 15 to 35 percent
Surface fragments: About 10 percent boulders, about 10 percent stones, about 15 percent cobbles, about 20 percent gravel
Drainage class: Well drained
Permeability: .06 to 0.2 in/hr (slow)
Available water capacity: About 3.3 inches (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Igneous Mountains
Ecological Site Id: 042XF001NM
Present native vegetation: Mountain savannah type consisting of sideoats grama, blue grama, bull muhly, metcalf muhly, wolftail, oaks, alligator juniper, and pinyon.
Land capability (nonirrigated): 7e
Typical Profile:
 A—0 to 2 inches; very gravelly clay loam
 Bt1—2 to 6 inches; very gravelly clay
 Bt2—6 to 11 inches; very cobbly clay
 Bt3—11 to 27 inches; very gravelly clay
 Btk—27 to 34 inches; gravelly clay
 Crk—34 to 42 inches; bedrock
 R—42 to 80 inches; bedrock
Depth to restrictive feature: 30 to 40 inches to bedrock (paralithic); 40 to 60 inches to bedrock (lithic)

Estimated Minor Components

Rotagilla and similar soils
Composition: About 6 percent
Component Geomorphic Setting: Mountain
Slope: 35 to 65 percent
 Thaad and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Chuzzie and similar soils
Composition: About 4 percent
Component Geomorphic Setting: Stream terrace
Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

122—Rotagilla very gravelly loam, 35 to 65 percent slopes**Map Unit Setting**

Landform: Mountain
Elevation: 5,800 to 6,800 feet (1,768 to 2,073 meters)
Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)
Average annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)
Frost-free period: 130 to 170 days

Map Unit Composition

Rotagilla and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities**Rotagilla soils**

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Haplustolls
Geomorphic position: Mountain
Parent material: Colluvium derived from monzonite
Slope: 35 to 65 percent
Surface fragments: About 10 percent cobbles, about 50 percent gravel
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 1.4 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Mountains

Ecological Site Id: 042XF001NM

Present native vegetation: Mountain savannah type consisting of sideoats grama, blue grama, bull muhly, prairie junegrass, mountainmahogany, pinyon pine, and alligator juniper.

Land capability (nonirrigated): 7e

Typical Profile:

A—0 to 2 inches; very gravelly loam

Bw1—2 to 7 inches; very gravelly loam

Bw2—7 to 16 inches; very gravelly loam

R—16 to 80 inches; bedrock

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

Estimated Minor Components

Poblano and similar soils

Composition: About 8 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Rock outcrop

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Chuzzie and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Stream terrace

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

123—Rock outcrop-Rotagilla complex, 65 to 90 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 5,800 to 6,800 feet (1,768 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Rock outcrop: 50 percent

Rotagilla and similar soils: 35 percent

Minor components: 15 percent

Properties and Qualities

Rock outcrop

Geomorphic position: Mountain

Parent material: Thickly bedded massive monzonite

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Rotagilla soils

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

Geomorphic position: Mountain

Parent material: Colluvium derived from monzonite

Slope: 65 to 90 percent

Surface fragments: About 10 percent cobbles, about 50 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.4 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Mountains

Ecological Site Id: 042XF001NM

Present native vegetation: Mountain savannah type consisting of sideoats grama, blue grama, bull muhly, prairie junegrass, mountainmahogany, pinyon pine, alligator juniper, and oak.

Land capability (nonirrigated): 8e

Typical Profile:

A—0 to 2 inches; very gravelly loam

Bw1—2 to 7 inches; very gravelly loam
 Bw2—7 to 16 inches; very gravelly loam
 R—16 to 80 inches; bedrock

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

Estimated Minor Components

Brewster and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Mountain

Slope: 65 to 90 percent

Arbol and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 65 to 90 percent

Chuzzie and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Stream terrace

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

124—Rotagilla very bouldery loam, 35 to 65 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 5,800 to 6,800 feet (1,768 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Rotagilla and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Rotagilla soils

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

Geomorphic position: Mountain

Parent material: Colluvium derived from monzonite

Slope: 35 to 65 percent

Surface fragments: About 10 percent cobbles, about 50 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.4 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Mountains

Ecological Site Id: 042XF001NM

Present native vegetation: Mountain savannah type consisting of sideoats grama, blue grama, bull muhly, prairie junegrass, mountainmahogany, pinyon pine, alligator juniper, and oak.

Land capability (nonirrigated): 7e

Typical Profile:

A—0 to 2 inches; very gravelly loam

Bw1—2 to 7 inches; very gravelly loam

Bw2—7 to 16 inches; very gravelly loam

R—16 to 80 inches; bedrock

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

Estimated Minor Components

Brewster and similar soils

Composition: About 7 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Rock outcrop

Composition: About 6 percent

Component Geomorphic Setting: Mountain

Chuzzie and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Stream terrace

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties

of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

151—Crotalus extremely gravelly loam, 15 to 35 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 4,000 to 5,300 feet (1,220 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Crotalus and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Crotalus soils

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Ustic Haplocalcids

Geomorphic position: Mountain

Parent material: Colluvium derived from tuff

Slope: 15 to 35 percent

Surface fragments: About 15 percent stones, about 15 percent cobbles, about 40 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 4.5 inches (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 8 mmhos/cm (slightly saline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Hill & Mountain (Desert Grassland)

Ecological Site Id: 042XY247TX

Present native vegetation: Desert grassland type consisting of black grama, sideoats grama, tridens, ocotillo, mesquite, and mariola.

Land capability (nonirrigated): 7e

Typical Profile:

A—0 to 2 inches; extremely gravelly loam

Bk1—2 to 8 inches; very cobbly loam

Bk2—8 to 27 inches; extremely gravelly loam

Bk3—27 to 45 inches; extremely gravelly clay loam

Bk4—45 to 80 inches; extremely gravelly clay loam

Estimated Minor Components

Reduff and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Tuftuff and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Sotol and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Chipotle and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Inset fan

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

152—Reduff very gravelly loam, 35 to 65 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 4,000 to 5,300 feet (1,220 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Reduff and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities

Reduff soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, nonacid, thermic Lithic Ustic Torriorthents
Geomorphic position: Mountain
Parent material: Colluvium derived from tuff
Slope: 35 to 65 percent
Surface fragments: About 10 percent cobbles, about 30 percent gravel
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 1.0 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Igneous Hill & Mountain (Desert Grassland)
Ecological Site Id: 042XY247TX
Present native vegetation: Desert grassland type consisting of black grama, sideoats grama, tobosa, creosotebush, acacia, range ratany, feather dalea, mariola, and prickly pear.
Land capability (nonirrigated): 7e
Typical Profile:
 A—0 to 2 inches; very gravelly loam
 C1—2 to 7 inches; extremely gravelly loam
 C2—7 to 14 inches; very gravelly loam
 R—14 to 80 inches; bedrock
Depth to restrictive feature: 4 to 20 inches to bedrock (lithic)

Estimated Minor Components

Crotalus and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Mountain
Slope: 15 to 35 percent

Rock outcrop
Composition: About 4 percent
Component Geomorphic Setting: Mountain

Chipotle and similar soils
Composition: About 3 percent
Component Geomorphic Setting: Inset fan
Slope: 1 to 3 percent

Silktassle and similar soils
Composition: About 3 percent
Component Geomorphic Setting: Mountain
Slope: 35 to 65 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

153—Rock outcrop-Reduff complex, 65 to 90 percent slopes

Map Unit Setting

Landform: Mountain
Elevation: 4,000 to 5,300 feet (1,220 to 1,616 meters)
Mean annual precipitation: 10 to 12 inches (254 to 305 millimeters)
Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)
Frost-free period: 170 to 210 days

Map Unit Composition

Rock outcrop: 50 percent
 Reduff and similar soils: 35 percent
 Minor components: 15 percent

Properties and Qualities

Rock outcrop

Geomorphic position: Mountain
Parent material: Thickly bedded massive welded tuff

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Reduff soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, nonacid, thermic Lithic Ustic Torriorthents

Geomorphic position: Mountain

Parent material: Colluvium derived from tuff

Slope: 65 to 90 percent

Surface fragments: About 30 percent gravel, about 10 percent cobbles

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.0 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Hill & Mountain (Desert Grassland)

Ecological Site Id: 042XY247TX

Present native vegetation: Desert grassland type consisting of black grama, sideoats grama, tridens, creosotebush, acacia, range ratany, feather dalea, mariola, and prickly pear.

Land capability (nonirrigated): 8e

Typical Profile:

A—0 to 2 inches; very gravelly loam

C1—2 to 7 inches; extremely gravelly loam

C2—7 to 14 inches; very gravelly loam

R—14 to 80 inches; bedrock

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

Estimated Minor Components

Crotalus and similar soils

Composition: About 9 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Chipotle and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Inset fan

Slope: 1 to 3 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication.

Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

155—Enash very gravelly loam, 3 to 8 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 4,700 to 6,300 feet (1,433 to 1,921 meters)

Mean annual precipitation: 13 to 15 inches (330 to 381 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Enash and similar soils: 95 percent

Minor components: 5 percent

Properties and Qualities

Enash soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Pachic Haplustolls

Geomorphic position: Mountain

Parent material: Gravelly alluvium and/or gravelly colluvium derived from tuff

Alluvium and/or colluvium derived from tuff

Slope: 3 to 8 percent

Surface fragments: About 50 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 4.5 inches (low)

Flooding hazard: Rare

Ponding hazard: None

Runoff class: High

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Gravelly (Mixed Prairie)

Ecological Site Id: 042XY275TX

Present native vegetation: Mixed prairie type consisting of blue grama, sideoats grama, bottlebrush squirreltail, a few scattered Arizona white oak, and alligator juniper.

Land capability (nonirrigated): 6c

Typical Profile:

- A—0 to 7 inches; very gravelly loam
- C1—7 to 14 inches; very gravelly loam
- C2—14 to 21 inches; very gravelly loam
- C3—21 to 35 inches; very gravelly loam
- C4—35 to 50 inches; gravelly loam
- C5—50 to 80 inches; very gravelly sandy loam

Estimated Minor Components

Thaad and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Tuftuff and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

156—Missile very gravelly fine sandy loam, 3 to 15 percent slopes

Map Unit Setting

Landform: Fan piedmont

Elevation: 4,000 to 5,300 feet (1,220 to 1,616 meters)

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

Average annual air temperature: 60 to 64 degrees F (15.6 to 17.8 degrees C)

Frost-free period: 170 to 210 days

Map Unit Composition

Missile and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Missile soils

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

Geomorphic position: Fan piedmont

Parent material: Alluvium derived from igneous rock

Slope: 3 to 15 percent

Surface fragments: About 15 percent cobbles, about 25 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 0.4 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Gravelly

Ecological Site Id: 042XC001NM

Present native vegetation: Desert grassland type consisting of black grama, bush muhly, sideoats grama, and creosotebush.

Land capability (nonirrigated): 7s

Typical Profile:

- A—0 to 2 inches; very gravelly fine sandy loam
- Bk—2 to 8 inches; extremely gravelly sandy loam
- Bkm—8 to 12 inches; petrocalcic
- 2Bk1—12 to 20 inches; gravelly loam
- 2Bk2—20 to 26 inches; loam
- 2Bk3—26 to 44 inches; cobbly loam
- 2Bk4—44 to 80 inches; gravelly loam

Depth to restrictive feature: 8 to 20 inches to petrocalcic

Estimated Minor Components

Chipotle and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Inset fan on fan piedmont

Slope: 1 to 3 percent

Piquin and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Terrace

Slope: 5 to 15 percent

Brewster and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Sotol and similar soils

Composition: About 1 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

161—Tuftuff extremely gravelly loam, 15 to 35 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 4,700 to 6,300 feet (1,433 to 1,921 meters)

Mean annual precipitation: 13 to 15 inches (330 to 381 millimeters)

Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)

Frost-free period: 140 to 180 days

Map Unit Composition

Tuftuff and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Tuftuff soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Pachic Argiustolls

Geomorphic position: Mountain

Parent material: Colluvium derived from tuff

Slope: 15 to 35 percent

Surface fragments: About 1 percent cobbles, about 60 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 2.9 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Hills

Ecological Site Id: 042XE002NM

Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, black grama, sotol, acacia, silktassel, and a few scattered alligator juniper, and pinyon.

Land capability (nonirrigated): 7e

Typical Profile:

A1—0 to 3 inches; extremely gravelly loam

A2—3 to 10 inches; very gravelly silt loam

A3—10 to 17 inches; very gravelly loam

Bt1—17 to 30 inches; extremely gravelly clay loam

Bt2—30 to 36 inches; extremely gravelly clay loam

R—36 to 80 inches; bedrock

Depth to restrictive feature: 21 to 40 inches to bedrock (lithic)

Estimated Minor Components

Silktassle and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Crotalus and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Enash and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Stream terrace

Slope: 3 to 8 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

162—Silktassel very gravelly loam, 35 to 65 percent slopes

Map Unit Setting

Landform: Mountain
Elevation: 4,700 to 6,300 feet (1,433 to 1,921 meters)
Mean annual precipitation: 13 to 15 inches (330 to 381 millimeters)
Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)
Frost-free period: 140 to 180 days

Map Unit Composition

Silktassel and similar soils: 85 percent
 Minor components: 15 percent

Properties and Qualities

Silktassel soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Aridic Lithic Argiustolls
Geomorphic position: Mountain
Parent material: Colluvium derived from tuff
Slope: 35 to 65 percent
Surface fragments: About 1 percent cobbles, about 40 percent gravel
Drainage class: Well drained
Permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity: About 1.5 inches (very low)
Flooding hazard: None
Ponding hazard: None
Runoff class: Very high
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42
Ecological Site: Igneous Hills
Ecological Site Id: 042XE002NM
Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, black grama, silktassel, sotol, acacia, and a few scattered alligator juniper and pinyon.
Land capability (nonirrigated): 7e
Typical Profile:
 A1—0 to 3 inches; very gravelly loam
 A2—3 to 7 inches; very gravelly loam
 Bt1—7 to 12 inches; very gravelly clay loam
 Bt2—12 to 17 inches; extremely gravelly clay loam
 R—17 to 80 inches; bedrock
Depth to restrictive feature: 10 to 20 inches to bedrock (lithic)

Estimated Minor Components

Arbol and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Mountain
Slope: 35 to 65 percent

Rock outcrop
Composition: About 5 percent
Component Geomorphic Setting: Mountain

Tuftuff and similar soils
Composition: About 5 percent
Component Geomorphic Setting: Mountain
Slope: 15 to 35 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

163—Rock outcrop-Silktassel complex, 65 to 95 percent slopes

Map Unit Setting

Landform: Mountain
Elevation: 4,700 to 6,300 feet (1,433 to 1,921 meters)
Mean annual precipitation: 13 to 15 inches (330 to 381 millimeters)
Average annual air temperature: 58 to 61 degrees F (14.4 to 16.1 degrees C)
Frost-free period: 140 to 180 days

Map Unit Composition

Rock outcrop: 45 percent
 Silktassel and similar soils: 40 percent
 Minor components: 15 percent

Properties and Qualities

Rock outcrop

Geomorphic position: Mountain
Parent material: Thickly bedded massive welded tuff

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Silktassel soils

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

Geomorphic position: Mountain

Parent material: Colluvium derived from tuff

Slope: 65 to 95 percent

Surface fragments: About 1 percent cobbles, about 40 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 1.5 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Hills

Ecological Site Id: 042XE002NM

Present native vegetation: Montane shrub type consisting of sideoats grama, blue grama, black grama, silktassel, sotol, acacia, scattered alligator juniper, and pinyon.

Land capability (nonirrigated): 8e

Typical Profile:

A1—0 to 3 inches; very gravelly loam

A2—3 to 7 inches; very gravelly loam

Bt1—7 to 12 inches; very gravelly clay loam

Bt2—12 to 17 inches; extremely gravelly clay loam

R—17 to 80 inches; bedrock

Depth to restrictive feature: 10 to 20 inches to bedrock (lithic)

Estimated Minor Components

Enash and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Stream terrace

Slope: 3 to 8 percent

Tuftuff and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Arbol and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

171—Thaad extremely gravelly loam, 15 to 35 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 5,800 to 6,800 feet (1,768 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Thaad and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Thaad soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Pachic Argiustolls

Geomorphic position: Mountain

Parent material: Colluvium derived from tuff

Slope: 15 to 35 percent

Surface fragments: About 1 percent cobbles, about 65 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 2.6 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Mountains

Ecological Site Id: 042XF001NM

Present native vegetation: Mountain savannah type consisting of sideoats grama, blue grama, bull muhly, mountainmahogany, pinyon pine, and alligator juniper.

Land capability (nonirrigated): 7e

Typical Profile:

A1—0 to 5 inches; extremely gravelly loam

A2—5 to 12 inches; very gravelly loam

Bt1—12 to 21 inches; extremely gravelly loam

Bt2—21 to 32 inches; extremely gravelly clay loam

Bt3—32 to 44 inches; extremely gravelly clay loam

R—44 to 80 inches; bedrock

Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)

Estimated Minor Components

Tuftuff and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Arbol and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Poblano and similar soils

Composition: About 3 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 45 percent

Enash and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Stream terrace

Slope: 3 to 8 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

172—Arbol extremely gravelly loam, 35 to 65 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 5,800 to 6,800 feet (1,768 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Arbol and similar soils: 85 percent

Minor components: 15 percent

Properties and Qualities

Arbol soils

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

Geomorphic position: Mountain

Parent material: Colluvium derived from tuff

Slope: 35 to 65 percent

Surface fragments: About 10 percent cobbles, about 50 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 0.8 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Mountains

Ecological Site Id: 042XF001NM

Present native vegetation: Mountain savannah type consisting of sideoats grama, blue grama, bull muhly, prairie junegrass, mountainmahogany, pinyon pine, alligator juniper, and oak.

Land capability (nonirrigated): 7e

Typical Profile:

A—0 to 2 inches; extremely gravelly loam

Bw1—2 to 7 inches; extremely gravelly loam

Bw2—7 to 16 inches; extremely gravelly silt loam

Cr—16 to 19 inches; bedrock

R—19 to 80 inches; bedrock

Depth to restrictive feature: 8 to 17 inches to bedrock (paralithic); 9 to 20 inches to bedrock (lithic)

Estimated Minor Components

Thaad and similar soils

Composition: About 8 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Rock outcrop

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Enash and similar soils

Composition: About 2 percent

Component Geomorphic Setting: Stream terrace

Slope: 3 to 8 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

173—Rock outcrop-Arbol complex, 65 to 90 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 5,800 to 6,800 feet (1,768 to 2,073 meters)

Mean annual precipitation: 14 to 16 inches (356 to 406 millimeters)

Average annual air temperature: 54 to 57 degrees F (12.2 to 13.9 degrees C)

Frost-free period: 130 to 170 days

Map Unit Composition

Rock outcrop: 45 percent

Arbol and similar soils: 40 percent

Minor components: 15 percent

Properties and Qualities

Rock outcrop

Geomorphic position: Mountain

Parent material: Thickly bedded massive welded tuff

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Arbol soils

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

Geomorphic position: Mountain

Parent material: Colluvium derived from tuff

Slope: 65 to 90 percent

Surface fragments: About 10 percent cobbles, about 50 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 0.8 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 42

Ecological Site: Igneous Mountains

Ecological Site Id: 042XF001NM

Present native vegetation: Mountain savannah type consisting of sideoats grama, blue grama, bull muhly, prairie junegrass, mountain mahogany, pinyon pine, alligator juniper, and oak.

Land capability (nonirrigated): 8e

Typical Profile:

A—0 to 2 inches; extremely gravelly loam

Bw1—2 to 7 inches; extremely gravelly loam

Bw2—7 to 16 inches; extremely gravelly silt loam

Cr—16 to 19 inches; bedrock

R—19 to 80 inches; bedrock

Depth to restrictive feature: 8 to 17 inches to bedrock (paralithic); 9 to 20 inches to bedrock (lithic)

Estimated Minor Components

Rotagilla and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Thaad and similar soils

Composition: About 5 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

Enash and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Stream terrace

Slope: 3 to 8 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

182—Aguja-Rock outcrop complex, 35 to 65 percent slopes

Map Unit Setting

Landform: Mountain

Elevation: 6,700 to 8,100 feet (2,043 to 2,469 meters)

Mean annual precipitation: 16 to 18 inches (406 to 457 millimeters)

Average annual air temperature: 42 to 46 degrees F (5.5 to 7.8 degrees C)

Frost-free period: 90 to 130 days

Map Unit Composition

Aguja and similar soils: 60 percent

Rock outcrop: 30 percent

Minor components: 10 percent

Properties and Qualities

Aguja soils

Taxonomic classification: Loamy-skeletal, mixed, superactive, frigid Typic Haplustolls

Geomorphic position: Mountain

Parent material: Colluvium derived from tuff

Slope: 35 to 65 percent

Surface fragments: About 5 percent cobbles, about 35 percent gravel

Drainage class: Well drained

Permeability: 0.2 to 0.6 in/hr (moderately slow)

Available water capacity: About 2.8 inches (very low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very high

Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio maximum: About 0 (nonsodic)

Interpretive Groups

Major Land Resource Area: 39

Ecological Site: Unspecified

Present native vegetation: Mixed conifer type consisting of ponderosa pine, Douglas fir, whortleleaf snowberry, prairie junegrass, and pinyon ricegrass.

Land capability (nonirrigated): 8e

Typical Profile:

A—0 to 2 inches; very gravelly loam

Bw1—2 to 8 inches; very gravelly silt loam

Bw2—8 to 15 inches; very gravelly loam

BC—15 to 35 inches; extremely gravelly loam

Cr—35 to 39 inches; bedrock

R—39 to 80 inches; bedrock

Depth to restrictive feature: 18 to 38 inches to bedrock (paralithic); 20 to 40 inches to bedrock (lithic)

Rock outcrop

Geomorphic position: Mountain

Parent material: Thickly bedded massive welded tuff

Interpretive Groups

Major Land Resource Area: 39

Ecological Site: Unspecified

Present native vegetation: Rock outcrop consists of exposures of bare bedrock with essentially no soil. It supports little or no vegetation.

Estimated Minor Components

Arbol and similar soils

Composition: About 6 percent

Component Geomorphic Setting: Mountain

Slope: 35 to 65 percent

Thaad and similar soils

Composition: About 4 percent

Component Geomorphic Setting: Mountain

Slope: 15 to 35 percent

For component horizon data, see "Chemical Properties of the Soils" and the "Physical Properties of the Soils" in the Use and Management section of this publication. Additional component horizon data is in "Soil Properties." A typical soil description, including range in characteristics, can be found in "Classification of the Soils."

Management

Major Use: wildlife habitat

For information about management, see the Use and Management section of this publication.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

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

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

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

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

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

Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and

indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited*, *somewhat limited*, and *very limited*. The suitability ratings are expressed as *well suited*, *moderately suited*, *poorly suited*, and *unsuited* or as *good*, *fair*, and *poor*.

Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation. The limitations appear in order from the most limiting to the least limiting. Thus, if more than one limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (USDA, 1961). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, 2*e*. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity.

Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2*e*-4 and 3*e*-6. These units are not given in all soil surveys.

The capability classification of map units in this survey area is given in the section "Detailed Soil Map Units."

Agricultural Waste Management

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

Tables 5a and 5b show the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places, it is high in content of sodium and chloride. In the context of these tables, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the tables are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops (application of manure and food-processing waste, application of sewage sludge, and disposal of wastewater by irrigation) and for waste management systems that are designed only for the purpose of wastewater disposal and treatment (overland flow of wastewater, rapid infiltration of wastewater, and slow rate treatment of wastewater).

The ratings are both verbal and numerical. Rating

class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

In table 5a, *application of manure and food-processing waste* not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are either solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of

waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Disposal of wastewater by irrigation not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings in the table are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented

pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

In table 5b, *overland flow of wastewater* is a process in which wastewater is applied to the upper reaches of sloped land and allowed to flow across vegetated surfaces, sometimes called terraces, to runoff-collection ditches. The length of the run generally is 150 to 300 feet. The application rate ranges from 2.5 to 16.0 inches per week. It commonly exceeds the rate needed for irrigation of cropland. The wastewater leaves solids and nutrients on the vegetated surfaces as it flows downslope in a thin film. Most of the water reaches the collection ditch, some is lost through evapotranspiration, and a small amount may percolate to the ground water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, and the design and construction of the system. Reaction and the cation-exchange capacity affect absorption. Reaction, salinity, and the sodium adsorption ratio affect plant growth and microbial activity. Slope, permeability, depth to a water table, ponding, flooding, depth to bedrock or a cemented pan, stones, and cobbles affect design and construction. Permanently frozen soils are unsuitable for waste treatment.

Rapid infiltration of wastewater is a process in which wastewater applied in a level basin at a rate of 4 to 120 inches per week percolates through the soil. The wastewater may eventually reach the ground water. The application rate commonly exceeds the rate needed for irrigation of cropland. Vegetation is not a necessary part of the treatment; hence, the basins may or may not be vegetated. The thickness of the soil material needed for proper treatment of the wastewater is more than 72 inches. As a result, geologic and hydrologic investigation is needed to ensure proper design and performance and to determine the risk of groundwater pollution.

The ratings in the table are based on the soil properties that affect the risk of pollution and the design, construction, and performance of the system. Depth to a water table, ponding, flooding, and depth to bedrock or a cemented pan affect the risk of pollution and the design and construction of the system. Slope, stones, and cobbles also affect design and construction. Permeability and reaction affect performance. Permanently frozen soils are unsuitable for waste treatment.

Slow rate treatment of wastewater is a process in which wastewater is applied to land at a rate normally

between 0.5 inch and 4.0 inches per week. The application rate commonly exceeds the rate needed for irrigation of cropland. The applied wastewater is treated as it moves through the soil. Much of the treated water may percolate to the ground water, and some enters the atmosphere through evapotranspiration. The applied water generally is not allowed to run off the surface. Waterlogging is prevented either through control of the application rate or through the use of tile drains, or both.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, and the application of waste. The properties that affect absorption include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, depth to bedrock or a cemented pan, reaction, the cation-exchange capacity, and slope. Reaction, the sodium adsorption ratio, salinity, and bulk density affect plant growth and microbial activity. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood of wind erosion or water erosion. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Rangeland

Guest Author: David Trujillo, Rangeland Management Specialist, NRCS.

Approximately 90 percent of the survey area is rangeland. Military training and operations are the primary use of the range. Other associated uses are livestock grazing, environmental study area, recreation, wildlife habitat, and watershed.

The military divides Fort Bliss into five main units. Of these five, McGregor Range is the largest, consisting of approximately 698,482 acres. A withdrawal of public land and condemnation of private holdings established McGregor Range in 1957. In 1966 a co-use area was established. The Bureau of Land Management (BLM) was given the responsibility of management.

McGregor Range

The only grazing on Fort Bliss occurs on McGregor Range. Approximately 290,000 acres of McGregor Range are used for livestock grazing. The BLM manages the grazing program and sets stocking rates on approximately 90 percent of McGregor Range. The United States Forest Service (USFS) manages the other 10 percent. Most of the grazing contracts on the range administered by BLM run for 9 months from

October to June of the following year, allowing deferment during the growing season. Some contracts run longer, allowing summer grazing. Grazing units are put up for public auction each year. There are 14 grazing units, which range in size from 8,000 to 32,000 acres. Most of the pastures are used for cow-calf operations. Those units with rough terrain are designated for yearling use. The allotments are utilized by both local and out-of-state ranchers. Livestock distribution is enhanced by an extensive pipeline system, high quality forage, and BLM assistance to ranchers using allotments.

In areas that have similar climate and topography, differences in the kind and amount of rangeland or forest understory vegetation are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for each soil that supports vegetation suitable for grazing, the ecological site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. An explanation of the column headings in table 6 follows.

An *ecological site* is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The hydrology of the site is influenced by development of the soil and plant community. The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Total dry-weight production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the

amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Yields are adjusted to a common percent of air-dry moisture content.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *rangeland composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range similarity index and rangeland trend. Range similarity index is determined by comparing the present plant community with the potential natural plant community on a particular rangeland ecological site. The more closely the existing community resembles the potential community, the higher the range similarity index. Rangeland trend is defined as the direction of change in an existing plant community relative to the potential natural plant community. Further information about the range similarity index and rangeland trend is available in chapter 4 of the National Range and Pasture Handbook (USDA, 1997). It can be found on the Internet at (<http://www.ftw.nrcs.usda.gov/glti/NRPH.html>) or in your local office of the Natural Resources Conservation Service.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, an area with a range similarity index somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Ecological sites

Arid lands are subject to frequent periods of drought. Proper management should include strategies the ranch manager can implement to decrease the consequences associated with climatic variability. Drought can reduce forage production by more than 50 percent. One of the most important aspects of

management in arid regions is proper stocking rate. Stocking rates should be conservative. Healthy plants will recover faster and produce more than those heavily grazed. Limited precipitation in arid environments makes recovery from heavy grazing slow to non-existent. Once the range is heavily infested with unpalatable shrubs, stocking rate will have little effect on improving production. An understanding of the soils and their associated historic climax plant communities facilitates their management.

Following is a list of ecological sites associated with soil map units that occur on this survey. General descriptive features and possible management limitations are given for each site. Detailed descriptions of ecological sites are provided in the Field Office Technical Guide, available from your local office of the Natural Resources Conservation Service.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XB023NM	Clayey

This site occurs as lake plains on the basin floor. The soils are fine textured, very deep, and well drained. The aspect is grassland with shrubs and cacti sparsely scattered. Tobosa is the dominant grass species, and burrograss readily invades with deterioration of the site. If the area is large enough it can be fenced and used as separate summer grazing pasture. Tobosa is most palatable and has the highest crude protein while the leaves are green. As the leaves mature and turn gray (senesce), crude protein declines by about half. Improper utilization can lead to large amounts of less palatable gray leaf material. A flexible rotation of cattle at conservative stocking rates helps to maintain a higher proportion of green leaf material in the standing crop. Fencing, pipelines, earthen tanks, and ponds are feasible. Mortality of seedlings caused by surface crusting and the probability of receiving adequate rainfall necessary to establish seedlings limit range seeding. Chemical brush management is preferred over mechanical, because of the difficulty of establishing new vegetation on disturbed ground.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XB011NM	Deep Sand
042XC005NM	Deep Sand
042XC022NM	Sand Hills

These sites occur on alluvial fans, sandy ridges, dunes, and rolling dunes on hills. Soils are coarse-textured, very deep, and excessively drained. The aspect is grassland-shrub mix. Dropseeds are the main grasses, with noticeable amounts of giant dropseed. Sand sagebrush, broom dalea, yucca, and fourwing

saltbush are common shrubs. Mesquite invades as the sites deteriorate. Forb composition fluctuates and can be quite high, depending on precipitation. Periodic deferment during the growing season July through September will enhance production and increase vigor of key species such as black grama and dropseeds. The soils are subject to accelerated wind erosion if adequate plant cover is not maintained. Facilitating practices such as fencing and livestock pipelines are feasible. Earthen stock-water tanks and ponds are limited by permeability. The effectiveness of range seeding is limited by low rainfall. Chemical brush management is preferred over mechanical because of the difficulty of establishing new vegetation on disturbed ground.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XB010NM	Gravelly
042XC001NM	Gravelly

These sites occur on piedmont slopes. Soils are gravelly and very gravelly, moderately coarse and medium textured. They range from very shallow to very deep and are well drained. The aspect is a grassland-shrub mix. Vegetation is naturally sparse, and good management is essential to maintain production and lessen erosion potential. As the site deteriorates, undesirable shrubs such as creosotebush rapidly increase. Facilitating practices such as fencing and livestock pipelines are feasible; however, they can be difficult because of amount of gravel or petrocalcic horizon. Earthen livestock tanks and ponds are limited by seepage. Mechanical range seeding and brush control are not recommended because of topography, erosion potential, and the probability of not receiving adequate moisture to establish seedlings.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XB024NM	Gravelly Sand

These sites occur on fan piedmonts or relict terraces. Soils are gravelly and very gravelly, moderately coarse-textured, and very deep. They are well or somewhat excessively drained. The aspect is characteristically a drought-tolerant grass/shrub mix. Vegetation is naturally sparse and consists primarily of dropseeds, bush muhly and creosotebush. Creosotebush dominates rapidly upon site deterioration. Fencing, wells, and pipelines are usually easily installed. Mechanical range seeding is not recommended because of the probability of not receiving adequate moisture to establish seedlings. Earthen livestock tanks and ponds are limited by seepage. Mechanical range seeding and brush control

are not recommended because of topography, erosion potential, and the probability of not receiving adequate moisture to establish seedlings.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XB014NM	Loamy

This site occurs as alluvial flats of basin floors. Soils are moderately deep to very deep and well drained. Soils are sandy clay loams overlain by a few inches of sand or sandy loam. The site is dominated by drought tolerant short and mid grasses. Woody shrubs and annual and perennial forbs are conspicuous components of this site. Black grama, bush muhly, dropseeds, and tobosa are the dominant grasses. Fourwing saltbush, soap tree yucca and ephedra are the key woody species. As the site starts to degrade, black grama and bush muhly decrease, and dropseeds, burrograss, and threeawns increase. As plant cover continues to decrease, large areas of unprotected bare ground are exposed, surface crusting occurs, infiltration is greatly reduced, erosion increases, and the site becomes highly susceptible to invasion by mesquite. As mesquite establishes dominance the site is converted into a mesquite coppice-dune shrubland. This site is generally well suited to underground livestock pipelines, fencing, earthen tanks, and ponds. The amount and reliability of precipitation limit the effectiveness of range seeding. Mesquite can be controlled chemically or by hand grubbing. Mechanical brush control is generally not recommended because of the difficulty of establishing new vegetation on disturbed ground.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XB016NM	Draw

This site occurs on alluvial flats on basin floors. It serves as desert drainageways which receive and transport runoff water from higher elevations. Soils are moderately fine textured, very deep and well drained. This site occurs as a grassy swale dominated by grasses, but where deeper wetting occurs may have a component of shrubs and trees that are dominant in aspect and natural to the site. The dominant grass of the historic plant community is tobosa. Other grasses include vine mesquite, alkali sacaton, cane bluestem, plains bristlegrass, burrograss, and feather fingergrass. Desert willow, mesquite, little leaf sumac, and catclaw mimosa are noticeable woody components. With retrogression, cane bluestem, vine mesquite, and alkali sacaton decrease, and burrograss and mesquite increase. Mesquite or burrograss can eventually dominate the site. These sites are important to wildlife. They provide thermal, hiding, and nesting cover and act as natural corridors for movement. This site is

suitable for grazing and can provide substantial amounts of forage following summer rains or overflow. This site responds well to a grazing system that alternates the season of use.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XB021NM	Limestone Hills
042XC020NM	Limestone Hills
042XY249TX	Limestone Hills & Mountains
042XY247TX	Igneous Hills & Mountains
042XY255TX	Sandstone Hills & Mountains

These sites occur as hills and as mountain flanks and bases. Soils are very or extremely gravelly, cobbly, or channery. They are medium and moderately fine-textured. Depth is variable, and they are well drained. The aspect is a grass/shrub/half shrub mix. Shrubs are more prevalent along drainageways, headers, and rough broken slopes. Black grama, sideoats grama, cane bluestem, and green sprangletop are important grass species. Woody species and less desirable grasses increase as retrogression occurs. Slope, distance to available water, and rugged topography are important factors of livestock distribution. Placing salt away from livestock water is an effective tool to aid livestock distribution. Rocky soils, steep slopes, and depth to bedrock limit fencing, livestock pipelines, earthen tanks, and ponds. Mechanical range seeding and brush control are not recommended because of rugged topography and limited available water capacity.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XB012NM	Sandy

This site occurs as sand sheets and alluvial flats on the basin floor or erosion remnants on fan piedmonts. Soils are coarse to moderately coarse-textured, moderately deep to very deep and well drained. The aspect of this site is grassland characterized by short and mid grasses. These sites are generally low in organic matter and display limited water-holding capacity. This characteristic, coupled with annual precipitation of 10 inches or less and high evaporation and transpiration rates, creates units that are easily dominated by more drought-resistant shrubs if adequate grass cover is not maintained. Typical species include dropseeds, black grama, sand sage, yucca, fourwing saltbush, and broom dalea. With retrogression, mesquite and creosotebush invade, and dunes may form. Periodic deferment during the growing season July through September will enhance production and increase the vigor of key species such as black grama and dropseeds. Grazing has the most severe effect on plants toward the end of the growing season, during and after seed formation. At this time

the plants' demand for carbohydrates is highest, and little time remains for re-growth. Facilitating practices, such as fencing and underground pipelines, are feasible. Earthen livestock tanks and ponds are limited by permeability. Mechanical range seeding is not recommended on these units because of the probability of not receiving adequate moisture to establish seedlings. Chemical brush management is preferred over mechanical because of the difficulty of establishing new vegetation on disturbed ground. Providing mobile shade facilities for livestock at key areas can help to increase distribution during the hot summer months.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XB014NM	Loamy

This site occurs as alluvial flats on basin floors. Soils are moderately deep to very deep and well drained. Soils are sandy clay loams overlain by a few inches of sand or sandy loam. The site is dominated by drought tolerant short and mid grasses. Woody shrubs and annual and perennial forbs are conspicuous components of this site. Black grama, bush muhly, dropseeds, and tobosa are the dominant grasses. Fourwing saltbush, soaptree yucca, and ephedra are the key woody species. As the site starts to degrade, black grama and bush muhly decrease and dropseeds, burrograss, and threeawns increase. As plant cover continues to decrease, large areas of unprotected bare ground are exposed, surface crusting occurs, infiltration is greatly reduced, erosion increases, and the site becomes highly susceptible to invasion by mesquite. As mesquite establishes dominance, the site is converted into a mesquite coppice-dunce shrubland. This site is generally well suited for underground livestock pipelines, fencing, earthen tanks, and ponds. The amount and reliability of precipitation limit the effectiveness of range seeding. Mesquite can be controlled chemically or by hand grubbing. Mechanical brush control is generally not recommended because of the difficulty of establishing new vegetation on disturbed ground.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XY242TX	Draw
042XD003NM	Draw

These sites occur on inset fans of fan piedmonts. They are natural drainage courses receiving extra moisture from adjoining higher elevations. Soils are medium or moderately fine-textured, very deep, and well drained. The surface or underlying layers may be extremely gravelly. Shrubs and or trees are dominant in aspect; however, grasses have the greatest annual production. They are usually very productive because

of good soil-air-moisture relationships and extra run-on water. Sideoats grama and cane bluestem are the dominant grass species. Desert willow, Apache plume, and brickellbush are noticeable woody components. Woody species and less desirable grasses increase with retrogression. These sites are important to wildlife. They provide thermal, hiding, and nesting cover and act as natural corridors for movement. Wildlife and livestock are attracted to draws because of the high protein forage and browse. This site responds well to a grazing system that allows for alternate rest, as long as the stocking rate is conservative during the season it is grazed.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XC006NM	Gyp-Upland

This site occurs as fan piedmonts or broad alluvial basins. The soils are gravelly, medium textured, very deep, and well drained. The underlying layers contain significant amounts of gypsum. This site is a grassland in which shrubs are sparsely and evenly distributed. Excess gypsum negatively affects the ability of plants to use available moisture and nutrients, giving this site a droughty appearance. Alkali sacaton, gyp grama, and black grama are the dominant grass species. When retrogression occurs, mesquite and broom snakeweed invade. Heavy use causes the plant community to deteriorate rapidly, and recovery is slow. These units can be used for occasional grazing when production is above normal, rather than as a regular part of livestock operations. These units are not suitable for any type of water-holding structure unless suitable lining material is used. Gypsum is highly soluble in water and subject to piping and seepage. Gypsum is also highly corrosive to steel pipelines, valves, and fittings. Fencing is feasible, but fencing into small grazing units for intensive grazing management is not economical because of low forage production. The amount and reliability of precipitation limit mechanical brush control and range seeding.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XC007NM	Loamy

These sites occur as inset fans on fan piedmonts. It is in a topographic setting to receive run-on water from higher adjacent areas. Soils are medium textured, very deep, and well drained. The site is a grassland with a few woody shrubs evenly scattered. Tobosa and black grama are the dominant grasses. As the site degrades, creosotebush, tarbush, mesquite, and burrograss can increase or invade readily. This site has good plant-air-moisture relationships, and production is generally good; however, the soils are subject to surface crusting and erosion when adequate plant cover is not

maintained. This site is generally well suited to underground livestock pipelines, fencing, earthen tanks and ponds. The amount and reliability of precipitation limit the effectiveness of range seeding. Mesquite, creosotebush, and tarbush can be controlled chemically or by hand grubbing. Mechanical brush control is generally not recommended because of the difficulty of establishing new vegetation on disturbed ground.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XY256TX	Sandy Loam

This site occurs as gently sloping inset fans on fan piedmonts. Soils are moderately coarse-textured, very deep, well drained, and underlain by varying amounts of gravel. The aspect of this site is a grassland with a few woody shrubs. Black grama is the dominant grass species. When retrogression occurs, mesquite invades strongly. As plant cover decreases, susceptibility to wind erosion increases. This site responds well to a system that varies the season of use. Fences and livestock pipelines are feasible. Permeability restricts earthen tanks and ponds. Mechanical range seeding is generally impractical because of limited rainfall. Mesquite can be controlled chemically or by hand grubbing. Mechanical removal is generally not recommended because of the difficulty of establishing plants on disturbed ground.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XD007NM	Gravelly

This site occurs on erosional fan remnants on fan piedmonts. Soils are gravelly, medium textured, shallow to a petrocalcic horizon (caliche), and well drained. The aspect of this site is a prairie grassland with scattered shrubs. The caliche layer helps to keep moisture perched and available to grasses. Black grama and blue grama are the dominant grasses. Creosotebush increases with site degradation. Changing the seasons of grazing and rest helps to keep a balanced and healthy plant community. Livestock pipelines and fences are difficult to install because of the caliche layer or amount of rock fragments in the profile. Depth and amount of rock fragments in the profile limit earthen tanks or ponds. Mechanical range seeding is feasible. This site is suited to chemical brush control. Mechanical brush control is better adapted to dense brush areas having limited grass cover.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XD001NM	Loamy
042XD005NM	Clay Loam Upland

These sites occur as alluvial fans, fan piedmonts, or inset fans on fan piedmonts. The soils are medium textured, very deep, and well drained. These soils can be highly productive. The aspect of these sites is grassland with a few scattered shrubs. Blue grama, alkali sacaton and tobosa are the major grasses. Burrograss, threeawns, and woody shrubs increase as the sites degrade. Grazing should be managed to increase the production and reproduction of warm season grasses. Periodically deferring grazing during the summer growing season, June through September, improves the vigor and reproduction of the grasses. These sites are generally well suited to range management practices, including fencing, livestock pipelines, earthen tanks and ponds, chemical and mechanical brush control, and range seeding.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XD002NM	Loamy Bottom

This site occurs as inset fans on fan piedmonts. Soils are medium textured, very deep, and well drained. They are in a position to receive extra run-on water from surrounding terrain and are occasionally subject to water ponding during the rainy season. The aspect of this site is a highly productive grassland. Available water holding capacity is very high. Alkali sacaton is the dominant grass both in aspect and composition. It withstands heavy grazing well and is best suited to livestock use while it is green and actively growing. Burrograss increases as the site degrades. This site is well suited to grazing management practices that include fencing, pipelines, range seeding, and earthen tanks and ponds. Both chemical and mechanical brush management are feasible.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XD004NM	Limy

This site occurs as inset fans on fan piedmonts. The soils are medium textured, very deep, well drained, and have a layer high in lime (calcium carbonate) usually within 2 feet of the surface. The aspect of this site is prairie grassland sparsely dotted with shrubs. Blue grama and black grama dominate this site, with yucca, winterfat, and other shrubs lightly scattered. As the site deteriorates, palatable species such as black grama, blue grama, and winterfat decrease, and species such as burrograss and creosote increase. This site responds well to a system that rotates the season of use. The potential for grazing is high. Fencing, livestock pipelines, range seeding and chemical brush control are feasible. Earthen tanks and ponds are better suited to finer

textured soils. Mechanical brush control is better suited to dense brush areas having limited grass cover.

Ecological Site ID *Ecological Site Name*
042XD008NM Loamy Sand

This site occurs on nearly level to gently sloping fan piedmonts. Soils are coarse-textured, very deep, and well drained. The aspect of this site is a grassland with scattered shrubs. Overuse of the site will cause a decrease of palatable grasses such as black grama and hairy grama. As grass cover decreases, shrubs such as sand sagebrush increase. Loss of ground cover leaves the site susceptible to wind erosion. This site responds well to a system that rotates the season of use. Fencing, livestock pipelines, range seeding, and mechanical and chemical brush control are feasible. Earthen tanks and ponds are limited by permeability of soils.

Ecological Site ID *Ecological Site Name*
042XD006NM Shallow Sandy

This site occurs on fan piedmonts. The soils are medium textured, shallow to a petrocalcic horizon (caliche), and well drained. The aspect of this site is prairie grassland sparsely dotted with shrubs. The site has a high potential for grazing. Black grama is the dominant grass species. The sandy texture allow water to infiltrate quickly, and the hardened caliche layer helps to keep the water perched and available for shallow rooted grass plants. Grazing management should maintain the plant cover, let litter accumulate, and prevent accelerated wind and water erosion. Varying the seasons of grazing and rest from year to year promotes a balanced plant community and helps to provide yearlong quality forage. Fencing and livestock pipelines are difficult to install because of the caliche layer. Water-holding structures such as tanks and ponds are better suited to finer textured soils. Range seeding is feasible, as is chemical brush control. Mechanical brush control is better suited to dense brush areas that have limited grass cover.

Ecological Site ID *Ecological Site Name*
042XY273TX Draw

This site occurs on stream terraces as frequently overflowed narrow draws, which receive runoff from surrounding higher elevations. Soils are very gravelly, medium textured, very deep, and well drained. The aspect of this site is predominately grassland with an intermittent overstory of shrubs and trees. Historically, fire may have had a large influence on the amount and

type of shrubs and trees. Sideoats grama and cane bluestem are the dominant grasses. Some of the typical woody species are Apache plume, brickellbush, and oaks. The woody species of this site provide a source of high-protein browse for livestock and wildlife, especially during winter and early spring. This site responds well to a grazing system that varies the season of use. Fall and winter rest is beneficial to shrubs. Summer rest is beneficial to warm-season grasses. This site is susceptible to erosion and to gully formation if adequate ground cover is not maintained. Fencing and livestock pipelines are feasible, but may be difficult because of the amount of rock fragments in the soil. The amount of rock fragments and permeability limit earthen tanks and ponds. Mechanical and chemical brush management are feasible; however, the effect on wildlife should be considered. When grazing sheep or goats or during calving season, predators can be a problem.

Ecological Site ID *Ecological Site Name*
042XY274TX Foothill Slope

This site occurs on alluvial fans created by outwash material from adjacent igneous hills. Soils are extremely bouldery, moderately coarse-textured, very deep, and well drained. The aspect of this site is a grassland dominated by mid and short grasses with occasional shrubs and trees. Mid grasses and woody vegetation increase with elevation. Short grasses, less palatable mid grasses, and undesirable shrubs such as mesquite increase as the site degrades. Livestock pipelines, fences, range seeding, tanks, ponds, and mechanical brush control are limited by the amount of rock fragments in the profile.

Ecological Site ID *Ecological Site Name*
042XY275TX Gravelly

This site occurs as gently sloping alluvial fans at mountain bases. Soils are very gravelly, medium textured, very deep, and well drained. The aspect of this site is a grassland with a few shrubs and trees. Short and mid grasses dominate the historic climax plant community. Mid grasses are more prominent on areas that receive extra water. Shrubs and trees are a minor component of the climax community. As retrogression occurs, the mid grasses and more palatable short grasses decline and woody species increase or invade. Degraded rangeland is subject to water erosion and gully formation. Range condition can be improved by varying the periods of grazing and rest from year to year. Livestock pipelines, fences, range seeding and mechanical brush control are feasible, but

can be difficult because of the amount of rock fragments in the profile. Tanks and ponds are limited by permeability.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XE002NM	Igneous Hills
042XE001NM	Limestone Hills

These sites occur as hills and bases, footslopes, and flanks of mountains. Soils are gravelly, very gravelly, extremely gravelly, or very cobbly. They are medium textured, very shallow, shallow, or moderately deep to bedrock, and well drained. The aspect of these sites is montane shrub-grassland. These units are situated below or on the drier, hotter, south and west aspect slopes of the pinon-juniper savannah sites. Sideoats grama and blue grama are important grasses. Sotol, acacia, silktassel, and shrub oak are prominent woody species. Scheduling grazing at different times of the year will help to insure a wider variety of forage species. Summer rest during the growing season improves the vigor and reproduction of warm season grasses. Fall and winter rests restore the shrubs. Spring and early summer rest is beneficial to cool season grasses and forbs. Steep slopes and rugged topography limit livestock distribution. Proper placement of salt can help to enhance livestock distribution. Steep slopes, amount of rock fragments, or shallow depth to bedrock limit fencing, livestock pipelines, and earthen tanks and ponds. Range seeding and mechanical brush control are not feasible because of slope, amount of rock, and shallow soils.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
042XF001NM	Igneous Mountains

These sites occur on mountain bases, flanks and tops. Soils are very gravelly, extremely gravelly, or very cobbly, and medium to moderately fine-textured. Depths range from very shallow to deep. Drainage class is well drained. The aspect of these sites is pinon-juniper-oak savannah. Sideoats grama, bull muhly, and blue grama are important grasses. Mountain mahogany, sumac, pinon, juniper, and oak are dominant woody species. The cooler temperatures and available winter moisture are beneficial to cool-season grass species. Varying the season of use will help to ensure a balanced plant community. Spring rest encourages growth of cool season grasses and forbs. In these units, topography plays a critical role in livestock distribution. Cattle tend to prefer valley bottoms, and use diminishes on slopes greater than 10 percent. Steep slopes and escarpments act as barriers to benches and ridge tops above. The ability or reluctance of livestock to use rugged terrain is important in proper stocking rates. Yearling cattle can

make better use of rugged terrain than cows with calves or mixed classes. Because of their smaller size and agility, sheep and goats will uniformly use slopes up to 45 percent. Use steadily declines as slopes increase above this level. Fencing, buried pipelines, mechanical seeding, earthen tanks and ponds are difficult, uneconomical, or not feasible because of shallow soils, topography, or amount of rock fragments in the profile. In places, pipelines to storage tanks or drinkers can sometimes be routed through deeper soils in drainageways or run aboveground utilizing high-density polyethylene pipe.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
070XD151NM	Limestone Hills

This site occurs on hills or ridges. The soils are very cobbly or very stony, and medium textured. They are shallow or very shallow to bedrock or a petrocalcic horizon. Drainage class is well drained. The aspect of this site is montane shrub-grassland or pinon-juniper savannah. Blue grama and sideoats grama are the dominant grasses. Mountain mahogany, pinon, and alligator juniper are the main woody species. Juniper, broom snakeweed, and threeawns increase as the site degrades. Lower elevations and south-facing slopes receive more intensive use during the spring, because of early green-up. Higher elevations and north-aspect slopes receive more use during the summer months. This site provides a source of high-quality browse for both livestock and wildlife. It is important to wintering elk and deer. This site responds well to a grazing system that rotates the season of use. Summer rest during the growing season improves the vigor and reproduction of warm season grasses. Fall and winter rests restore the shrubs. Spring and early summer rest is beneficial to cool season grasses and forbs. This site is poorly suited to rangeland improvement practices such as pipelines, fences, and earthen tanks and ponds because of the shallow and very shallow depth and amount of rock fragments in the profile. Range seeding and mechanical brush control are limited by slope and rough topography. When grazing sheep or goats or during calving season, predators can be a problem.

<i>Ecological Site ID</i>	<i>Ecological Site Name</i>
070XD153NM	Loamy

This site occurs as gentle sloping alluvial uplands and valleys. The soils are medium textured, very deep, and well drained. The aspect of this site is that of a grassland with a few forbs and woody shrubs. Blue grama, sideoats grama, and western wheatgrass are important grass species. Alligator juniper and skunkbush sumac are the dominant woody species.

Upon deterioration, woody shrubs and trees invade and grass cover is reduced, leaving the site susceptible to erosion and the formation of gullies. On mountain ranges, easily accessed areas will often receive excess use and the more difficult steeper upland areas receive little use. This site responds well to a grazing system that rotates the period or season of use such as rest rotation or deferred rotation grazing. These grazing systems will allow the plants time to re-grow and set seed. Fencing, underground livestock pipelines, tanks, and ponds are feasible. This site is suitable for mechanical range seeding and brush control.

Recreation

The soils of the survey area are rated in tables 7a and 7b according to limitations that affect their suitability for recreation. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited

for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in tables 7a and 7b can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

In table 7a, *camp areas* require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after

development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

In table 7b, *paths and trails* for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated

according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated as suited or poorly suited. A rating of *suited* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *poorly suited* indicates that limitations are present and range from moderate to severe for the designated element or kind of habitat and that creating, improving, or maintaining habitat is difficult, impractical, or intensive management is required.

The elements of wildlife habitat are described in the following paragraphs.

Desertic Herbaceous Plants are plants that have little or no woody component, such as grasses and forbs that are suited to arid climates. Soil properties and features that affect the growth of desertic herbaceous plants are soil temperature, soil moisture, depth, surface texture and available water capacity. Examples of desertic herbaceous plants are dropseeds, black grama, tobosa, bush muhly, paper flower, globemallow, and desert marigold.

Domestic Grasses / Legumes for Food and Cover are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are fescue, lovegrass, brome grass, clover, and alfalfa.

Upland Desertic Shrubs and Trees are described in the following paragraphs.

Desertic Shrubs are plants that are suited to an arid climate and have persistent, woody stems, a relatively low growth habit, and generally produce several basal shoots instead of a single bole.

Desertic Trees are woody perennials suited to arid climates. They are usually single stemmed, have a definite crown shape, and reach a mature height of at least 4 meters. The distinction between woody plants known as trees and those called shrubs is gradual. Some plants, such as mesquite, may grow as either trees or shrubs.

Soil properties and features that affect the growth of desertic shrubs and trees are soil depth, surface texture, amount of rock fragments in the soil profile, soil temperature, soil moisture, and available water

capacity. Examples of upland desertic shrubs and trees include mesquite, sand sagebrush, desert willow, creosotebush, and broom dalea.

Upland Shrubs and Vines are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, amount of rock fragments in the soil profile, and soil moisture. Examples of shrubs are mountainmahogany, silktassel, snowberry, skunkbush sumac, and Apacheplume.

Upland Wild Herbaceous Plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are western wheatgrass, blue grama, sideoats grama, prairie junegrass, globemallow, croton, bladderpod and goldeneye species.

Wildlife

Guest Authors: Brian Locke Ph.D., Ecologist, Directorate of Environment, DOD; David Seery, Wildlife Biologist, NRCS; and David Trujillo, Rangeland Management Specialist, NRCS.

There is a high degree of topographic relief within the boundaries of Fort Bliss, with elevations ranging from about 3,900 feet above mean sea level in the basin to approximately 8,900 feet in the Organ Mountains. The diverse topography and associated climate and temperature gradients of Fort Bliss combine to create numerous unique habitats. The vegetative communities range from Chihuahuan Desert shrub on the basin floor to mixed conifer forests of the Organ Mountains.

Most of the 1.1 million acres of Fort Bliss is dominated by Chihuahuan Desert and its accompanying vegetation types, characterized by desert shrub vegetative associations. The vegetation types within the boundary of Fort Bliss include desert shrub, desert grassland, grading into prairie grassland on Otero Mesa and woodland vegetation at the higher elevations of the Organ and Sacramento Mountains. Following is a list of the physiographic units on Fort Bliss and their related characteristic wildlife species. It should be noted that many of these species are not restricted to a specific unit or habitat type and can occur across many of the physiographic units.

The **Basin floor** is the central feature of Fort Bliss occupying approximately 400,000 acres. It is located between the Organ and Franklin Mountains on the

west, the Sacramento Mountains to the north, and Otero Mesa and the Hueco Mountains on the east. Elevations range from 3,900 feet to approximately 4,200 feet. The basin consists mainly of coppice dunes and sand sheets. The vegetation is desert shrub type consisting chiefly of mesquite, creosote, sandsage, fourwing saltbush, and dropseeds. Characteristic wildlife species include gemsbok or oryx (introduced), coyote, badger, kit fox, black-tailed jackrabbit, desert cottontail, Ord's kangaroo rat, black-throated sparrow, pyrrhuloxia, house finch, western kingbird, northern mockingbird, Scott's oriole, Chihuahuan raven, burrowing owl, Sawin's hawk, western diamondback rattlesnake, and leopard lizard.

Fan piedmonts are situated above and drain into the basin floor. Elevation is approximately 4,200 to 5,700 feet. The network of arroyos that dissect the fans act as conduits and corridors for water and wildlife. Bats are known to use these arroyos as corridors from cliff areas to foraging locations. Neotropical migrant birds, birds that spend their winters in the new world tropics, but nest in North America also use the arroyos as corridors as they move through the desert to nesting habitat at higher elevations, or latitudes farther north. The fan piedmonts exhibit high structural and vegetation diversity, and their associated arroyos are characterized by a diversity of species rather than a particular group of species. Species associated with the fan piedmonts include mountain lion, bobcat, javalina, ring-tail, Merriam's kangaroo rat, white-throated woodrat, pocket mice, ash-throated flycatcher, say's phoebe, verdin, blue grosbeak, and probably the highest density of gambel's quail in the survey area.

Otero Mesa is a broad rolling prairie grassland situated south of the foothills of the Sacramento Mountains. Elevation is between 4,700 and 6,000 feet. Blue grama, black grama, and yucca are the dominant vegetation species on the higher areas in association with tobosa and alkali sacaton abundant along broad drainageways and swales. These grasslands are home to a variety of animals, including pronghorn antelope, barbary sheep along the escarpments, mule deer in canyons along the escarpment and into fan piedmonts, black-tailed prairie dog, ferruginous hawk, eastern meadowlark, horned lark, Baird's sparrow, box turtle, prairie rattlesnake, Mojave rattlesnake, desert short-horned lizard, lesser earless lizard, and little striped whiptail.

The **Hueco Mountains** are predominately steep limestone hills that cross the New Mexico-Texas border at the southeast corner of Fort Bliss. Elevation ranges from 4,500 to approximately 5,700 feet. The Chihuahuan Desert shrublands and grasslands include

black grama, sideoats grama, lechuguilla, sotol, creosote, beargrass, cacti, mariola, and a few scattered junipers. The wildlife species are very similar to those found on the fan piedmonts.

The **Franklin Mountains** cross the Texas-New Mexico Border running north and south. The only portions inside the Fort Bliss boundary are located within Castner Range. The northern tip of the Franklin Mountains terminates in the southeast portion of Dona Ana Range-North Training Areas. These mountains consist of both igneous and sedimentary rock. Elevation is 4,300 to 5,500 feet. Vegetation is predominately Chihuahuan Desert shrublands and grasslands consisting of black grama, sideoats grama, sotol, ocotillo, creosote, a very diverse array of cacti, and yucca. The wildlife here is very similar to those found on the fan piedmonts and the escarpment portion of Otero Mesa. The rocky ridges, cliffs, and abandoned mines of these and other mountainous areas are important habitat for bats and for raptors such as golden eagles, prairie falcons, and red-tailed hawks where appropriate cliffs are found.

The **Organ Mountains** are very steep, rugged igneous mountains forming a portion of the western boundary of Fort Bliss. Elevation ranges from 4,700 to 8,900 feet. Vegetation along the lower foothills is mainly of the montane shrub type. As elevation increases, pinon-juniper-oak savannah dominates. Small pockets of pinon-juniper woodlands and mixed conifer vegetation typify the highest elevations. Springs, seeps, perennial water, and high vegetation and structural diversity combine to make the Organ Mountains one of the most important habitat units on Fort Bliss. A wide variety of wildlife use the Organs, some of which include mule deer, mountain lion, hepatic tanager, plumbeous vireo, gray vireo, and red-faced warbler. Probably the highest density of raptor nesting habitat (golden eagle, red-tailed hawk, prairie falcon) is in this area.

The **Sacramento Mountains** form the northern boundary of Fort Bliss. Only a small portion of the mountains is within the installation boundary, with elevations of approximately 5,500 to 7,600 feet. The vegetation on the portion within the boundary is primarily pinon-juniper and mountainmahogany. The Sacramento Mountains are the only unit on post that support an elk population, bear, or wild turkey. This unit has the highest densities of bald and golden eagles. It provides foraging areas for wintering bald eagles, and golden eagle nesting areas. Other species include black-chinned sparrow, black-headed grosbeak, plumbeous vireo, bushtit, pinon jay, scrub jay, rufous crowned sparrow, western tanager, and black-throated gray warbler.

For a complete list of species that occur on Fort Bliss and management considerations, see the Integrated Natural Resources Management Plan (Dept. of the Army, 1998).

Military Operations

The soils of the survey area are rated according to limitations or probabilities that affect their suitability for military operations. Soils are rated for bivouac areas, helicopter landing zones, and excavations for fighting positions. These ratings are shown in table 9.

The ratings for bivouac areas, helicopter landing zones, and fighting positions are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect military operations. *Not limited* indicates that the soil has features that are very favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Slightly limited* indicates that the soil has features that are favorable for the specified use. The limitations can be overcome. Good to fair performance and low maintenance can be expected. *Moderately limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning or design. Fair performance and moderate maintenance can be expected. *Limited* indicates that the soil has one or more features that are significant limitations for the specified use. The limitations can be overcome, but generally require special design procedures that may result in additional time and effort. Fair performance and moderate to high maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major special design procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The numerical ratings are shown as decimal fractions ranging from 0.00 to 1.00. Limitation classes are assigned as follows:

Not limited	0.00
Slightly limited	0.01 to 0.30
Moderately limited	0.31 to 0.60
Limited	0.61 to 0.99
Very limited	1.00

The numerical ratings used to express the severity of individual limitations indicate gradations between the point at which a soil feature has the greatest negative

impact on the use and the point at which the soil feature is not a limitation.

Limitation class terms, such as *very limited* or *limited*, limitation ratings, and numerical ratings are shown for each soil feature listed. As many as three soil features may be listed for each soil component if applicable. The overall limitation rating for the soil component is based on the most severe limitation.

Ratings for bivouac areas are listed in table 9. Bivouac areas are subject to heavy foot traffic and some light vehicular traffic. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Ratings for helicopter landing zones are listed in table 9. For safe landing zones, the surface needs to be free of large stones, not too steep, and not too dusty. Special considerations may be needed for areas that are ponded or have high seasonal water tables. The soil properties that affect the location of helicopter landing zones are slope, surface stones, ponding, and dust (Dept. of the Army, 1994b). Slopes over 8 percent are considered very limited.

Ratings for excavations for vehicle fighting positions, individual fighting positions and crew-served fighting positions are located in table 9. Excavations for vehicle fighting positions are generally up to 8 feet deep (Dept. of the Army, 1987). These excavations are generally made by machine. Crew-served weapon fighting positions are generally 4 to 5 feet deep and vary in width according to the type of weapon used. These excavations may be dug by hand or machine (Dept. of the Army, 1987). Individual fighting positions are generally 18 inches deep, the length of 1 or 2 M16's wide, and body length long. These excavations are generally hand dug but may be dug by machine (Dept. of the Army, 1987). The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or cemented pan, the amount of cobbles and large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture,

depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing. In all excavations, depth to bedrock, wetness, clay content, coarse fragments and slope are major considerations.

Soil Trafficability

Soil trafficability is the capacity of soils to support military vehicles (Dept. of the Army, 1994a). Factors impacting soil trafficability include soil strength, slope, stickiness, slipperiness, vegetation, organic-soil areas, and man-made obstacles. The information provided is limited to problems associated with soils. It does not include problems associated with natural or man-made obstacles, such as forests or ditches, nor information on vehicle characteristics (such as the maximum tilt or side angle at which a vehicle can climb without power stall or overturning).

For trafficability classification purposes, each soil map unit was placed into one of three topographic classes: high topography, low topography, and low topography, high moisture (Dept. of the Army, 1994a). Absolute elevation has no significance in identifying the topography class. High topography areas are usually well drained and do not have water tables within 48 inches of the surface at any time during the year. Low topography areas have water tables occurring between 20 and 48 inches of the surface at some time during the year. Low topography, high moisture areas have water tables within 20 inches of the soil surface and are ponded or frequently flooded for long or very long duration.

Estimates for trafficability were made using the vehicle categories, vehicle cone indices (VCI) and critical layers located in table 10. VCI's were used for 1 pass and 50 passes. The VCI values listed in the tables are estimates. The critical layer is the layer that supports the weight of the vehicle in question. Within the critical layer depth, the UNIFIED soil group was used to make the estimation. Table 11 includes a list of vehicles, the vehicle weights, values for VCI₁ and VCI₅₀, and vehicle type number. This table was adapted from Field Manual (FM) 5-430-00-1, appendix D (Dept. of the Army, 1994a).

Tables 12a, 12b, 12c, and 12d provide the probability ratings for military vehicle types in wet season conditions. These ratings were calculated using information from table 7 and 8 of FM 5-430-00-1, pp. 7-8. Ratings were made for VCI at one pass (VCI₁) and fifty passes (VCI₅₀). A wet season is defined as a time in which weather conditions combine to produce high soil moistures. For this estimation, the wet season extends from the first of November to the first of May. Wet seasons may occur at any time as a

result of prolonged rains and floods. Adding moisture to soil affects the strength of that soil; the effect differs with soil types.

Tables 13a and 13b provide the probability ratings for military vehicle types in dry season conditions. These ratings were calculated using information from tables 7 and 8 of FM 5-430-00-1. A dry season is defined as a time when climatic and vegetation factors combine to produce, in general, low soil moistures. The dry season is from about the first of May to the first of November. A dry season may also occur at other times of the year as a result of long periods of fair weather. During the dry season, fine-grained soils usually are trafficable. Even in the dry season, trafficability is affected by a high water table that results from underground springs, low-lying and poorly drained soils, or any other cause.

The ratings in the table for soil trafficability are both verbal and numerical. The values are based on the probability of the vehicle of making 1 or 50 passes through a map unit. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect soil trafficability. *Excellent* indicates that the soil has features that are very favorable for the vehicle to make a pass. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Good* indicates that the soil has features that are moderately favorable for a vehicle to make a pass. The limitations can be overcome or minimized by special planning. Good performance and moderate maintenance can be expected. *Fair* indicates that the soil has one or more features that are significant limitations for the vehicle to make a pass. The limitations can be overcome, but generally require consideration of vehicle spacing or traversing at an angle across slope or other maneuvers to make a pass. Fair performance and moderate to high maintenance can be expected. *Poor* indicates that the soil has one or more features that are unfavorable for the vehicle to make a pass. The limitations generally cannot be overcome. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual soil features. The numerical ratings are shown as decimal fractions ranging from 1.00 to 0.00. Probability classes are assigned as follows:

Excellent	0.90 to 1.00
Good	0.75 to 0.89
Fair	0.50 to 0.74
Poor	0.00 to 0.49

The numerical ratings used to express the severity of individual soil features indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation.

Probability class terms, such as *excellent* or *good*, probability ratings, and numerical ratings are shown for each soil feature listed. Five soil features are listed for each soil component. These features are soil strength, slipperiness, stickiness, slope and large stones. Slipperiness should not be considered for tracked vehicles or vehicles with traction devices. The overall probability rating for the soil component is based on the most severe property.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading "Soil Properties."

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil

structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Tables 14a and 14b show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the tables are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations

generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

In table 14a, *dwellings* are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

In table 14b, *local roads and streets* have an all-weather surface and carry automobile and light truck

traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Tables 15a and 15b show the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has

features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

In table 15a, *septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between a depth of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils, the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils

eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water.

Groundwater contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

In table 15b, a *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of groundwater pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for

plants. It should not have excess sodium, salts, or lime and should not be too acid.

Construction Materials

Tables 16a and 16b give information about the soils as potential sources of gravel, sand, topsoil, reclamation material, and roadfill. Normal compaction, minor processing, and other standard construction practices are assumed.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In tables 16a and 16b, only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

In table 16a, the soils are rated *good, fair, or poor* as potential sources of sand and gravel. A rating of *good* or *fair* means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

In table 16b, the soils are rated *good, fair, or poor* as potential sources of topsoil, reclamation material, and roadfill. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading,

and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Soil Properties

Engineering Index Properties

Table 17 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly

organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical Properties

Table 18 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as

classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In table 18, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In the table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $1/3$ - or $1/10$ -bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when

the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. The estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in table 18 as the K factor (K_w and K_f) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of several factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet

and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor K_w indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor K_f indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.
- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams.
4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Properties

Table 19 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases 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. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable bases plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used

as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is 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. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Soil Features

Table 20 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during

thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Water Features

Table 21 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or

soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. Table 21 indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 21 indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1998; USDA 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. Table 22 shows the classification of the soils in the survey area. 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 an illuvial horizon of silicate clay, plus *arid*, 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 Calciargids (*Calc*, meaning appreciable accumulation of lime, plus *argid*, the suborder of the Aridisols that has an illuvial horizon of silicate clay).

SUBGROUP. Each great group has a typical subgroup. Other subgroups are intergrades or extragrades. The typical subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The

adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Calciargids.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, superactive, thermic Typic Calciargids.

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.

Soil Series and Their Morphology

In this section, 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. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (USDA, 1993). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (USDA, 1999) and in Keys to Soil Taxonomy (USDA, 1998). 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.

Aguena Series

The soils in the Aguena series are classified as mixed, thermic Ustic Torripsamments. These very deep, excessively drained, moderately rapidly permeable soils formed in eolian sediments derived dominantly

from mixed sources. The soils are on rolling dunes on hills. Slope is 5 to 35 percent. Elevation is 4,200 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual air temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Aguena fine sand in an area of Aguena fine sand, 15 to 35 percent slopes; in Otero County, New Mexico; approximately 14.3 miles east and 14.3 miles north of Orogrande; 400 feet west and 2,150 feet south of the northeast corner of sec. 7, T. 20 S., R. 11 E. USGS Culp Canyon topographic quadrangle; latitude 32 degrees 35 minutes 5.27 seconds north and longitude 105 degrees 51 minutes 1.02 seconds west. UTM zone 13, 420198E, 3605387N; NAD 27.

A—0 to 7 inches; reddish yellow (7.5YR 6/6) crushed, fine sand, strong brown (7.5YR 5/6) crushed, moist; single grain; loose, nonsticky and nonplastic; 5 percent clay, common fine roots and common very fine roots; noneffervescent, by HCl, 1 normal; slightly alkaline (pH 7.6); gradual smooth boundary.

C—7 to 80 inches; reddish yellow (7.5YR 6/6) crushed, fine sand, strong brown (7.5YR 5/6) crushed, moist; single grain; loose, nonsticky and nonplastic; 5 percent clay, few fine roots and few very fine roots; noneffervescent, by HCl, 1 normal; moderately alkaline (pH 7.9).

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Particle-size control section (weighted average):

Clay content: 2 to 8 percent

A horizon:

Hue: 5YR or 7.5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 6 to 8, dry or moist

C horizon:

Hue: 5YR or 7.5YR

Value: 4 to 7 dry, 4 to 6 moist

Chroma: 6 to 8, dry or moist

Aguja Series

The soils in the Aguja series are classified as loamy-skeletal, mixed, superactive, frigid Typic Haplustolls.

These moderately deep, well drained, moderately slowly permeable soils formed in colluvium from tuff. The soils are on mountain tops, flanks, and bases. Slope is 35 to 65 percent. Elevation is 6,700 to 8,100 feet. Mean annual precipitation is about 17 inches, the mean annual temperature is about 44 degrees F, and the frost-free period is 90 to 130 days.

Typical Pedon

Typical pedon of Aguja very gravelly loam in an area of Aguja-Rock outcrop complex, 35 to 65 percent slopes; in Dona Ana County, New Mexico; approximately 4.3 miles west and 2.5 miles south of White Sands, 1,350 feet north and 1,500 feet east of the southwest corner of sec. 5, T. 23 S., R. 4 E. USGS Organ Peak topographic quadrangle; latitude 32 degrees, 20 minutes, 02 seconds north and longitude 106 degrees 34 minutes 04 seconds W. UTM zone 13S 353395E, 3578215N; NAD 27.

A—0 to 2 inches; brown (7.5YR 4/2) crushed, very gravelly loam, black (7.5YR 2.5/1) crushed, moist; weak fine granular structure; soft, very friable; slightly sticky and slightly plastic; common fine roots throughout; 22 percent clay; 35 percent nonflat subrounded 0.1- to 3-inch tuff gravel and 5 percent nonflat subrounded 3- to 10-inch tuff cobbles, noneffervescent by HCl, 1 normal; slightly acid; gradual smooth boundary.

Bw1—2 to 8 inches; brown (7.5YR 4/2) crushed, very gravelly silt loam, black (7.5YR 2.5/1) crushed, moist; weak fine subangular blocky structure; soft, very friable; moderately sticky and moderately plastic; common fine roots throughout; few fine dendritic tubular pores; 22 percent clay; 35 percent nonflat subrounded 0.1- to 3-inch tuff gravel and 10 percent nonflat subrounded 3- to 10-inch tuff cobbles; noneffervescent by HCl, 1 normal; neutral; gradual wavy boundary.

Bw2—8 to 15 inches; brown (7.5YR 5/3) crushed, very gravelly loam, brown (7.5YR 4/2) crushed, moist; weak medium subangular blocky structure; soft, very friable; moderately sticky and moderately plastic; few fine and medium roots throughout; few fine dendritic tubular pores; 20 percent clay; 40 percent nonflat subrounded 0.1- to 3-inch tuff gravel and 10 percent nonflat subrounded 3- to 10-inch tuff cobbles; noneffervescent by HCl, 1 normal; neutral; gradual wavy boundary.

BC—15 to 35 inches; light brown (7.5YR 6/3) crushed, extremely gravelly loam, brown (7.5YR 4/3) crushed, moist; weak fine subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; few fine and medium roots throughout; few fine dendritic

tubular pores; 20 percent clay; 60 percent nonflat subrounded 0.1- to 3-inch tuff gravel and 10 percent nonflat subrounded 3- to 10-inch tuff cobbles; noneffervescent by HCl, 1 normal; neutral; abrupt smooth boundary.

Cr—35 to 39 inches; 95 percent nonflat subangular indurated 3- to 10-inch tuff rock fragments.

R—39 inches; thickly bedded massive tuff.

Range in Characteristics

Soil moisture: A typic ustic moisture regime. Intermittently moist in some part of the soil moisture control section December through April and July through October.

Mean annual soil temperature: 43 to 47 degrees F.

Depth to bedrock: 20 to 40 inches

Thickness of mollic epipedon: 7 to 14 inches

Clay content: 18 to 27 percent

Rock fragments: 35 to 60 percent

Reaction: slightly acid to neutral

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Rock fragments: tuff rock fragments; 35 to 60 percent total rock fragments; 35 to 50 percent gravel; 5 to 10 percent cobbles.

Bw horizons:

Hue: 5YR or 7.5YR

Value: 3 to 5 dry, 2 to 4 moist

Chroma: 1 to 3, dry or moist

Texture modifier: gravelly, very gravelly

Rock fragments: tuff rock fragments; 35 to 60 percent total coarse rock fragments; 35 to 50 percent gravel; 10 to 20 percent cobbles.

Texture: loam or silt loam

BC horizon:

Hue: 5YR or 7.5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Texture modifier: very gravelly or extremely gravelly

Rock fragments: tuff rock fragments; 60 to 80 percent total rock fragments; 60 to 75 percent gravel; 5 to 15 percent cobbles.

Texture: loam and silt loam

Allamore Series

The soils in the Allamore series are classified as loamy-skeletal, mixed, superactive, thermic Lithic Ustic Haplocalcids. These very shallow and shallow,

well drained, moderately permeable soils formed in colluvium from metamorphic sandstone. The soils are on hills. Slope is 10 to 35 percent. Elevation is 4,200 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Allamore very gravelly loam in an area of Allamore very gravelly loam, 10 to 35 percent slopes; in Otero County, New Mexico; approximately 10.25 miles east of Orogrande; 800 feet west and 2,200 feet north of the southeast corner of sec. 21, T. 22 S., R. 10 E. USGS Wilde Tank Canyon topographic quadrangle; latitude 32 degrees 22 minutes 35 seconds north and longitude 105 degrees 55 minutes 0.0 seconds west. UTM zone 13S, 413772E, 3582357N; NAD 27.

A—0 to 2 inches; light reddish brown (5YR 6/3) crushed, very gravelly loam, reddish brown (5YR 5/3) crushed, moist; 16 percent clay; weak very fine subangular blocky structure; very friable, slightly hard, nonsticky, slightly plastic; few very fine roots throughout; 15 percent angular 3- to 10-inch sandstone rock fragments and 25 percent angular 0.1- to 3-inch sandstone rock fragments; strong effervescence, by HCl, 1 normal; clear smooth boundary.

Bk1—2 to 5 inches; light reddish brown (5YR 6/3) crushed, very gravelly sandy loam, reddish brown (5YR 5/3) crushed, moist; 16 percent clay; weak very fine subangular blocky structure; very friable, slightly hard, nonsticky, slightly plastic; few very fine roots throughout; prominent carbonate coats on rock fragments; 10 percent angular 3- to 10-inch sandstone rock fragments and 40 percent angular 0.1- to 3-inch sandstone rock fragments; strong effervescence, by HCl, 1 normal; clear smooth boundary.

Bk2—5 to 12 inches; reddish brown (5YR 5/4) crushed, very gravelly sandy loam, reddish brown (5YR 4/4) crushed, moist; 16 percent clay; weak very fine subangular blocky structure; very friable, slightly hard, nonsticky, slightly plastic; few very fine roots throughout; prominent carbonate coats on rock fragments; 10 percent angular 3- to 10-inch sandstone rock fragments and 45 percent angular 0.1- to 3-inch sandstone rock fragments; strong effervescence, by HCl, 1 normal; abrupt wavy boundary.

R—12 inches; indurated sandstone bedrock.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all

parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Soil temperature: 61 to 65 degrees F.

Depth to bedrock: 8 to 20 inches

Depth to calcic horizon: 2 to 6 inches

Particle-size control section (weighted average):

Clay content: 8 to 18 percent

Rock fragments: 35 to 60 percent

Calcium carbonate equivalent: 15 to 30 percent (less than 20 mm fraction)

A horizon:

Hue: 5YR to 10YR

Value: 5 or 6, dry or moist

Chroma: 2 to 4, dry or moist

Rock fragments: sandstone rock fragments; 35 to 60 percent total rock fragments; 20 to 30 percent gravel; 15 to 40 percent cobbles

Bk horizon:

Value: 6 or 7 dry, 4 to 7 moist

Chroma: 3 or 4, dry or moist

Rock fragments: sandstone rock fragments; 35 to 60 percent total rock fragments; 25 to 50 percent gravel; 10 to 20 percent cobbles

Altuda Series

The soils in the Altuda series are classified as loamy-skeletal, carbonatic, thermic Lithic Calciustolls. These very shallow and shallow, well drained, moderately slowly permeable soils formed in colluvium from limestone. The soils are on hills. Slope is 5 to 65 percent. Elevation is 4,900 to 6,000 feet. Mean annual precipitation is about 13 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Altuda very cobbly loam in an area of Altuda-Rock outcrop complex, 5 to 15 percent slopes; in Otero County, New Mexico; approximately 22.4 miles east and 8.7 miles north of Orogrande; 2,100 feet west and 1,200 feet north of the southeast corner of section 3, T. 21 S., R. 12 E. USGS El Paso Canyon topographic quadrangle; latitude 32 degrees 30 minutes 15 seconds north and longitude 105 degrees 42 minutes 17 seconds west. UTM zone 13S, 433796E, 3596378N; NAD 27.

Ak—0 to 2 inches; brown (7.5YR 5/3) crushed, very cobbly loam, dark brown (7.5YR 3/3) crushed, moist; 20 percent clay; weak fine subangular blocky structure; very friable, slightly hard, slightly sticky, slightly plastic; common fine roots throughout; 5 percent

discontinuous prominent carbonate coats on bottom surfaces of rock fragments; 20 percent subangular 3- to 10-inch limestone rock fragments and 30 percent subangular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; moderately alkaline, pH 8.1, pH meter 1:1 water; gradual wavy boundary.

Bk—2 to 12 inches; brown (7.5YR 5/3) crushed, extremely cobbly loam, dark brown (7.5YR 3/3) crushed, moist; 20 percent clay; weak fine subangular blocky structure; very friable, slightly hard, slightly sticky, slightly plastic; common fine roots throughout; few fine dendritic tubular pores; 20 percent discontinuous prominent carbonate coats on rock fragments; 5 percent fine spherical carbonate masses throughout; 30 percent subangular 3- to 10-inch limestone rock fragments and 40 percent subangular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; moderately alkaline, pH 8.3, pH meter 1:1 water; abrupt wavy boundary.

R—12 inches; coarsely fractured limestone bedrock.

Range in Characteristics

Soil moisture: Aridic moisture regime bordering on ustic

Soil temperature: 59 to 64 degrees

Depth to bedrock: 8 to 20 inches

Particle-size control section (weighted average):

Clay content ranges: 20 to 35 percent

Rock fragments: limestone and caliche range from 35 to about 75 percent with about 15 to 50 percent gravel size, 10 to 45 percent cobble size, and 0 to 10 percent stone size.

Calcium carbonate equivalent: 40 to 70 percent by weight.

Ak horizon

Hue: 10YR or 7.5YR,

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Bk horizon

Hue: 10YR or 7.5YR,

Value: 4 or 5, dry 2 or 3 moist

Chroma: 2 or 3, dry or moist

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

Arbol Series

The soils in the Arbol series are classified as loamy-skeletal, mixed, superactive, mesic Lithic Haplustolls. These shallow and very shallow, well drained, moderately slowly permeable soils formed in colluvium

derived from tuff. The soils are on mountain tops and flanks. Slope is 35 to 90 percent. Elevation is 5,800 to 6,800 feet. Mean annual precipitation is about 15 inches, and the mean annual temperature is about 56 degrees F. The frost-free period is 130 to 170 days.

Typical Pedon

Typical pedon of Arbol very gravelly loam in an area of Arbol very gravelly loam, 35 to 65 percent slopes; in Dona Ana County, New Mexico; approximately 4.5 miles west and 5 miles south of White Sands; 2,920 feet east and 740 feet south of the northwest corner of sec. 20, R. 4 E., T. 23 S. USGS Organ Peak topographic quadrangle; latitude 32 degrees 17 minutes 8.54 seconds north and longitude 106 degrees 33 minutes 2.38 seconds west. UTM zone 13, 353684E, 3574293N; NAD 27.

A—0 to 2 inches; brown (7.5YR 5/3) crushed, extremely gravelly loam, dark brown (7.5YR 3/3) crushed, moist; 22 percent clay; weak fine granular structure; loose; slightly sticky and slightly plastic; few fine roots throughout; 50 percent nonflat subangular indurated 0.1- to 3-inch tuff gravel and 10 percent nonflat subangular indurated 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; moderately acid; clear smooth boundary.

Bw1—2 to 7 inches; brown (7.5YR 4/4) crushed, extremely gravelly loam, dark brown (7.5YR 3/3) crushed, moist; 24 percent clay; moderate medium subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; common fine roots throughout; few fine dendritic tubular pores; 60 percent nonflat subangular indurated 0.1- to 3-inch tuff gravel and 15 percent nonflat subangular indurated 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; moderately acid; clear smooth boundary.

Bw2—7 to 16 inches; brown (7.5YR 5/4) crushed, extremely gravelly silt loam, dark brown (7.5YR 3/4) crushed, moist; 24 percent clay; weak fine subangular blocky structure; moderately hard, firm; moderately sticky and moderately plastic; few fine roots throughout; few fine dendritic tubular pores; 50 percent nonflat subangular indurated 0.1- to 3-inch tuff gravel and 20 percent nonflat subangular indurated 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; slightly acid; clear smooth boundary.

Cr—16 to 19 inches; 95 percent nonflat subangular indurated 3- to 10-inch tuff rock fragments.

R—19 inches; thickly bedded massive tuff.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on

aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 55 to 59 degrees F.

Thickness of the mollic epipedon: 7 to 10 inches

Depth to lithic contact: 9 to 20 inches

Depth to paralithic contact: 8 to 17 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 60 to 85 percent

Reaction: moderately acid to slightly acid

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Texture modifier: very gravelly, extremely gravelly

Rock fragments: tuff rock fragments; 60 to 70 percent total rock fragments; 40 to 60 percent gravel; 5 to 15 percent cobbles

Bw horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 2.5 or 3 moist

Chroma: 2 to 4, dry or moist

Texture modifier: very gravelly or extremely gravelly

Rock fragments: tuff rock fragments, 60 to 85 percent total rock fragments; 40 to 70 percent gravel; 10 to 25 percent cobbles

Texture: loam, silt loam

Armesa Series

The soils in the Armesa series are classified as fine-loamy, carbonatic, thermic Ustic Haplocalcids. These very deep, well drained, moderately slowly permeable soils formed in alluvium modified by eolian deposits. The soils are on inset fans on fan piedmonts. Slope is 1 to 5 percent. Elevation is 4,700 to 6,000 feet. Mean annual precipitation is about 13 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Armesa very fine sandy loam in an area of Jerag-Armesa very fine sandy loams, 2 to 5 percent slopes; in Otero County, New Mexico; about 300 feet north of county road 506 where it intersects the southwest corner of SW1/4 sec. 10, T. 21 S., R. 11 E.

A—0 to 3 inches; brown (10YR 5/3) very fine sandy

loam, dark yellowish brown (10YR 4/4) moist; weak thin platy structure in upper 1 inch and weak fine granular structure in lower part; soft, very friable, slightly sticky and nonplastic; common very fine, fine and medium roots; strong effervescence, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bw—3 to 8 inches; brown (10YR 5/3) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common fine, few medium and coarse roots; strong effervescence, by HCl, 1 normal; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—8 to 14 inches; brown (10YR 5/3) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common fine, few medium and coarse roots; violent effervescence, by HCl, 1 normal, carbonates along surfaces of peds, as threads and soft masses, about 8 percent carbonate nodules; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk2—14 to 31 inches; very pale brown (10YR 8/2) silty clay loam, very pale brown (10YR 7/3) moist; massive; extremely hard, very firm, slightly sticky and slightly plastic; few fine, medium and coarse roots; violent effervescence, carbonates are slightly cemented and some cemented lenses are scattered along the contact of the overlying horizon; moderately alkaline, pH 8.2; clear wavy boundary.

Bk3—31 to 36 inches; very pale brown (10YR 8/3) gravelly silty clay loam, very pale brown (10YR 7/3) moist; massive; extremely hard, very firm, slightly sticky and nonplastic; few fine medium and coarse roots; 15 percent gravel; violent effervescence, almost completely plugged with secondary carbonates; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk4—36 to 80 inches; pink (7.5YR 7/4) gravelly sandy clay loam, strong brown (7.5YR 5/6) moist; massive; soft, very friable, slightly sticky and nonplastic; few coarse roots; 15 percent gravel; strong effervescence, lime in form of thin threads and coating on some gravel; moderately alkaline, pH 8.0.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The soil moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Depth to calcic horizon: 7 to 19 inches

Particle-size control section (weighted average):
Calcium carbonate equivalent: Averages 45 to 65 percent equivalent, disseminated above Bk horizons and segregated in Bk horizon.

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 3 to 5 moist

Chroma: 3 or 4 dry or moist

Bw and Bk1 horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 2 to 4 moist

Texture: Fine sandy loam, sandy clay loam, very fine sandy loam, or loam

Lower Bk horizons:

Hue: 7.5YR or 10YR

Value: 6 to 8 dry, 5 to 7 moist

Chroma: 2 to 8 dry or moist

Texture: silt loam, silty clay loam, or sandy clay loam with less than 20 percent gravel. Fine sandy loam is below 30 inches in some pedons.

Bankston Series

The soils in the Bankston series are classified as loamy-skeletal, carbonatic, thermic Ustic Haplocalcids. These moderately deep, well drained, moderately permeable soils formed in residuum and local colluvium from limestone bedrock and dolomite. These soils are on strongly sloping to steep hills. Slopes range from 8 to 35 percent. Elevation is 4,200 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual air temperature is about 62 degrees F, and the frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Bankston extremely channery loam in an area of Bankston extremely channery loam, 15 to 35 percent slopes; in Otero County, New Mexico; approximately 11.8 miles south and 3.1 miles east of Orogrande in an unsectionalized area. USGS Desert NE topographic quadrangle; latitude 32 degrees 12 minutes 14 seconds north and longitude 106 degrees 2 minutes 3.5 seconds west. UTM zone 13, 402351E, 3563303N; NAD 27.

Ak—0 to 3 inches; light brown (7.5YR 6/4) extremely channery loam, brown (7.5YR 4/4) moist; weak medium platy structure parting to moderate very fine granular; soft, very friable; nonsticky and nonplastic; few very fine roots throughout; 15 percent clay; few distinct continuous carbonate coats on rock fragments; common medium rounded carbonate nodules

throughout; 55 percent limestone channers and 15 percent angular limestone gravel; violent effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

Bk1—3 to 14 inches; pink (7.5YR 7/4) extremely cobbly loam, brown (7.5YR 5/4) moist; moderate fine subangular blocky structure; soft, very friable; nonsticky and nonplastic; few very fine roots throughout; 15 percent clay; many prominent continuous carbonate coats on rock fragments; common medium rounded carbonate nodules throughout; 45 percent angular limestone cobbles and 20 percent angular limestone gravel and 5 percent channers; violent effervescence, by HCl, 1 normal; moderately alkaline; gradual smooth boundary.

Bk2—14 to 25 inches; pink (7.5YR 7/3) extremely cobbly loam, brown (7.5YR 5/4) moist; moderate fine subangular blocky structure; soft, very friable; nonsticky and nonplastic; few very fine roots throughout; 15 percent clay; many prominent continuous carbonate coats on rock fragments; common medium rounded carbonate nodules throughout; 50 percent angular limestone cobbles and 20 percent angular limestone gravel; violent effervescence, by HCl, 1 normal; moderately alkaline; abrupt smooth boundary.

R—25 inches; thickly bedded massive limestone.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Depth to bedrock: 20 to 40 inches

Depth to calcic horizon: 0 to 4 inches

Particle-size control section (weighted average):

Rock fragments: 60 to 70 percent in the particle-size control section

Clay content: 10 to 18 percent

Calcium carbonate equivalent: 40 to 60 percent (less than 20 mm fraction)

Ak horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 or 5 moist

Chroma: 2 to 4, dry or moist

Bk horizon:

Hue: 7.5YR or 10YR

Value: 5 to 8 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

Texture: extremely cobbly loam or extremely gravelly loam

Bissett Series

The soils in the Bissett series are classified as loamy-skeletal, carbonatic, thermic Lithic Ustic Haplocalcids. These very shallow and shallow, well drained, moderately slowly permeable soils formed in colluvium from limestone. The soils are on hills. Slope is 5 to 65 percent. Elevation is 4,200 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Bissett very gravelly loam in an area of Bissett-Rock outcrop complex, 15 to 35 percent slopes; in Otero County, New Mexico; approximately 1.9 miles south and 10.5 miles east of Orogrande; 1,900 feet east and 1,600 feet south of the northwest corner of sec. 34, R. 10 E., T. 22 S. USGS Mack Tanks topographic quadrangle; latitude 32 degrees 21 minutes 6 seconds north and longitude 105 degrees 54 minutes 30.50 seconds west. UTM zone 13, 414542E, 3579593N; NAD 27.

Ak—0 to 3 inches; brown (10YR 5/3) crushed, very gravelly loam, brown (10YR 4/3) crushed, moist; 25 percent clay; weak fine granular structure; very friable, slightly hard, slightly sticky, slightly plastic; common fine roots throughout; common prominent discontinuous calcium carbonate coats on rock fragments; 15 percent subrounded 3- to 10-inch limestone rock fragments and 35 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

Bk—3 to 13 inches; brown (10YR 5/3) crushed, very gravelly loam, brown (10YR 4/3) crushed, moist; 27 percent clay; weak fine subangular blocky structure; very friable, slightly hard, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; many prominent discontinuous calcium carbonate coats on rock fragments; 5 percent subrounded 3- to 10-inch limestone rock fragments and 35 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; abrupt smooth boundary.

R—13 inches; limestone bedrock.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Soil temperature: 61 to 65 degrees F.

Depth to bedrock: 7 to 19 inches

Particle-size control section (weighted average):

Clay content: 25 to 30 percent

Rock fragments: 35 to 60 percent

Calcium carbonate equivalent: 40 to 80 percent (less than 20 mm fraction)

Ak horizon:

Hue: 7.5YR or 10YR

Value: 4 or 5, dry or moist

Chroma: 2 or 3, dry or moist

Rock fragments: limestone rock fragments; 35 to 60 percent total rock fragments; 25 to 45 percent gravel; 10 to 20 percent cobbles

Bk horizon:

Hue: 7.5YR or 10YR

Value: 4 or 5, dry or moist

Chroma: 2 or 3, dry or moist

Rock fragments: limestone rock fragments; 35 to 60 percent total rock fragments; 25 to 45 percent gravel; 5 to 20 percent cobbles

Brewster Series

The soils in the Brewster series are classified as loamy-skeletal, mixed, superactive, thermic Lithic Haplustolls. These very shallow and shallow, well drained, moderately slowly permeable soils formed in colluvium from igneous bedrock. The soils are on hills and mountains. Slope is 35 to 90 percent. Elevation is 4,700 to 6,300 feet. Mean annual precipitation is about 14 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Brewster very gravelly loam in an area of Brewster very gravelly loam, 35 to 65 percent slopes; in Dona Ana County, New Mexico; approximately 4.9 miles south and 1.6 miles west of White Sands; 1,500 feet east and 1,800 feet south of the northwest corner of sec. 22, R. 4 E., T. 23 S. USGS Organ Peak topographic quadrangle; latitude 32 degrees 17 minutes 48 seconds north and longitude 106 degrees 31 minutes 29 seconds west. UTM zone 13, 356436E, 3574177N; NAD 27.

A1—0 to 4 inches; reddish brown (5YR 4/3) crushed, extremely gravelly loam, dark reddish brown (5YR 2.5/2) crushed, moist; 18 percent clay; weak fine subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; 20 percent nonflat subangular 3- to 10-inch monzonite rock fragments and 40 percent nonflat 0.1- to 3-inch monzonite rock fragments; noneffervescent, by HCl, 1 normal; slightly acid, pH 6.5, pH meter 1:1 water; clear smooth boundary.

A2—4 to 8 inches; reddish brown (5YR 4/3) crushed, extremely gravelly loam, dark reddish brown (5YR 2.5/2) crushed, moist; 20 percent clay; weak fine subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; 20 percent nonflat subangular 3- to 10-inch monzonite rock fragments and 50 percent nonflat subangular 0.1- to 3-inch monzonite rock fragments; noneffervescent, by HCl, 1 normal; neutral, pH 7.0, pH meter 1:1 water; abrupt smooth boundary.

R—8 inches; monzonite bedrock.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Soil temperature: 59 to 62 degrees F.

Depth to bedrock: 4 to 20 inches

Thickness of mollic epipedon: 4 to 20 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 35 to 75 percent

A horizon:

Hue: 5YR to 10YR

Value: 4 or 5 dry

Chroma: 2 or 3 dry

Rock fragments: igneous rock fragments; 35 to 75 percent total rock fragments; 25 to 50 percent gravel; 10 to 25 percent cobbles

Cale Series

The soils in the Cale series are classified as fine-silty, mixed, superactive, mesic Aridic Argiustolls. These very deep, well drained, moderately slowly permeable soils formed in alluvium from limestone. The soils are

on valleys. Slope is 2 to 5 percent. Elevation is 5,500 to 6,800 feet. Mean annual precipitation is about 15 inches, and the mean annual temperature is about 56 degrees F. The frost-free period is 130 to 170 days.

Typical Pedon

Typical pedon of Cale silt loam in an area of Cale silt loam, 2 to 5 percent slopes; in Otero County, New Mexico; approximately 7.1 miles south and 3.5 miles east of Timberon; 1,250 feet west and 575 feet north of the southeast corner of sec. 29, R. 13 E., T. 20 S. USGS El Paso Canyon topographic quadrangle; latitude 32 degrees 32 minutes 6.12 seconds north and longitude 105 degrees 37 minutes 50.19 seconds west. UTM zone 13, 440782E, 3599730N; NAD 27.

A1—0 to 2 inches; brown (10YR 4/3) crushed, silt loam, dark brown (10YR 3/3) crushed, moist; 22 percent clay; strong thick platy structure; friable, hard, slightly sticky, slightly plastic; many very fine roots throughout; strong effervescence, by HCl, 1 normal; slightly alkaline; abrupt smooth boundary.

A2—2 to 8 inches; brown (10YR 4/3) crushed, silt loam, dark brown (10YR 3/3) crushed, moist; 24 percent clay; moderate medium subangular blocky structure; very friable, moderately hard, slightly sticky, moderately plastic; many very fine roots throughout; strong effervescence, by HCl, 1 normal; slightly alkaline; abrupt smooth boundary.

Btk1—8 to 13 inches; dark yellowish brown (10YR 4/4) crushed, silty clay loam, dark yellowish brown (10YR 3/4) crushed, moist; 30 percent clay; strong very coarse prismatic parts to moderate medium subangular blocky structure; very friable, moderately hard, moderately sticky, moderately plastic; many very fine roots throughout; common very fine tubular pores; 15 percent discontinuous distinct clay films on all faces of peds; 1 percent fine spherical weakly cemented carbonate nodules throughout; strong effervescence, by HCl, 1 normal; slightly alkaline; clear smooth boundary.

Btk2—13 to 19 inches; dark yellowish brown (10YR 4/4) crushed, silty clay loam, dark yellowish brown (10YR 3/4) crushed, moist; 30 percent clay; strong very coarse prismatic parts to moderate medium subangular blocky structure; very friable, moderately hard, moderately sticky, moderately plastic; many very fine roots throughout; common very fine tubular pores; 10 percent discontinuous distinct clay films on all faces of peds; 1 percent fine spherical weakly

cemented carbonate nodules throughout; strong effervescence, by HCl, 1 normal; slightly alkaline; clear smooth boundary.

Btk3—19 to 30 inches; brown (7.5YR 5/4) crushed, silty clay loam, dark brown (7.5YR 3/4) crushed, moist; 30 percent clay; strong very coarse prismatic parts to moderate medium subangular blocky structure; very friable, moderately hard, moderately sticky, moderately plastic; few fine roots throughout and common very fine roots throughout; common very fine tubular pores; 10 percent discontinuous distinct clay films on all faces of peds; 20 percent fine threadlike carbonate masses and 1 percent medium spherical weakly cemented insect casts throughout; violent effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

Btk4—30 to 52 inches; light brown (7.5YR 6/4) crushed, silty clay loam, brown (7.5YR 4/4) crushed, moist; 28 percent clay; strong very coarse prismatic parts to moderate medium subangular blocky structure; very friable, moderately hard, slightly sticky, moderately plastic; few very fine roots throughout; 10 percent discontinuous prominent clay films on all faces of peds; 30 percent fine threadlike carbonate masses throughout; violent effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

Bk—52 to 80 inches; light brown (7.5YR 6/4) crushed, silt loam, brown (7.5YR 4/4) crushed, moist; 26 percent clay; moderate fine prismatic parts to moderate medium subangular blocky structure; very friable, moderately hard, moderately sticky, moderately plastic; few very fine roots throughout; 25 percent fine threadlike carbonate masses throughout; violent effervescence, by HCl, 1 normal; slightly alkaline.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Soil temperature: 55 to 59 degrees F.

Thickness of mollic epipedon: 8 to 14

Particle-size control section (weighted average):

Clay content: 27 to 35 percent

A horizon:

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Btk horizon:

Hue: 7.5YR or 10YR

Value: 4 to 6 dry, 3 or 4 moist

Bk horizon:

Value: 4 to 7 dry, 3 or 4 moist

Calcium carbonate equivalent: 5 to 12 percent (less than 20 mm fraction)

Canutio Series

The soils in the Canutio series are classified as loamy-skeletal, mixed, superactive, calcareous, thermic Typic Torriorthents. These very deep, well drained, moderately rapidly permeable soils formed in alluvium. The soils are on fan piedmonts. Slope is 5 to 15 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Canutio gravelly sandy loam; in El Paso County, Texas; about 10 miles north of El Paso via U.S. Highway 80; 75 feet east of a gravel road from a point 0.7 mile north of Tom Mays Park Road from a point 2.4 miles east of U.S. Highway 80 at Canutillo, Texas. Latitude 31 degrees, 54 minutes, 47 seconds north and longitude 106 degrees, 33 minutes, 32 seconds west. UTM zone 13, 352157E, 3531719N; NAD 27.

Ak—0 to 11 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard; very friable; common fine and medium roots; 20 percent gravel and 10 percent cobbles; rock fragments are igneous and limestone; surface cover of about 60 percent rock fragments from 1/4 inch to 6 or 8 inches in diameter; calcium carbonate coating on rock fragments; strong effervescence, by HCl, 1 normal; moderately alkaline; gradual wavy boundary.

Bck—11 to 80 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; loose; very friable; few roots in upper part; 40 percent gravel, 15 percent cobbles and 5 percent stones. Rock fragments are mostly rounded igneous and limestone rock fragments with calcium carbonate coatings; violent effervescence, by HCl, 1 normal; moderately alkaline.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Thickness of the soil ranges from 60 to more than 80 inches or more over unconsolidated gravelly or cobbly sediments. The rock fragments in the Ak and Bck horizons are coated with calcium carbonate. Calcium carbonate content of the soil is relatively uniform throughout. Texture of the fine earth fraction is sandy loam or loam. Reaction is moderately alkaline.

Particle-size control section (weighted average):

Clay content: 8 to 18 percent

Ak horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 or 5 moist

Chroma: 2 to 4 dry or moist

Rock fragments: igneous and limestone rock fragments; 25 to 50 percent total rock fragments; 25 to 50 percent gravel; 5 to 30 percent cobbles; 0 to 20 percent stones

Bck horizon:

Hue: 7.5YR or 10YR

Value: 6 or 7 dry, 4 to 6 moist

Chroma: 2 to 4 dry or moist

Rock fragments: igneous and limestone rock fragments; 35 to 85 percent rock fragments; 25 to 65 percent gravel; 0 to 40 percent cobbles; 0 to 30 percent stones

Caticon Series

The soils in the Caticon series are classified as fine, smectitic, thermic Vertic Haplocambids. These very deep, well drained, moderately slowly permeable soils formed in pluvial lake sediments and alluvium. The soils are on lake plains on basin floors. Slope is 1 to 3 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Caticon silty clay in an area of Caticon silty clay, 1 to 3 percent slopes; in Dona Ana County, New Mexico; approximately 10.6 miles south and 5.6 miles east of White Sands; 120 feet west and

2,000 feet south of the northeast corner of sec. 12, T. 24 S., R. 5 E. USGS Newman NW topographic quadrangle; latitude 32 degrees 14 minutes 12.97 seconds north and longitude 106 degrees 22 minutes 39.43 seconds west. UTM zone 13, 370202E, 3567345N; NAD 27.

A—0 to 2 inches; light brown (7.5YR 6/3) crushed, silty clay, brown (7.5YR 4/4) crushed, moist; 37 percent clay; strong very fine granular structure; very hard, firm, moderately sticky, very plastic; many very fine roots throughout; violent effervescence, by HCl, 3 normal; moderately alkaline; clear smooth boundary.

Bw1—2 to 8 inches; light brown (7.5YR 6/3) crushed, silty clay, brown (7.5YR 4/4) crushed, moist; 37 percent clay; strong coarse prismatic parts to strong coarse subangular blocky structure; very hard, firm, very sticky, very plastic; common very fine roots throughout; violent effervescence, by HCl, 3 normal; moderately alkaline; clear smooth boundary.

Bw2—8 to 22 inches; brown (7.5YR 5/3) crushed, clay, brown (7.5YR 4/4) crushed, moist; 40 percent clay; moderate coarse prismatic structure; extremely hard, very firm, very sticky, very plastic; few very fine roots throughout; violent effervescence, by HCl, 3 normal; moderately alkaline; gradual smooth boundary.

Bk1—22 to 35 inches; brown (7.5YR 5/3) crushed, clay, brown (7.5YR 4/4) crushed, moist; 40 percent clay; moderate coarse prismatic structure; extremely hard, very firm, very sticky, very plastic; few very fine roots throughout; 10 percent fine irregular carbonate masses throughout; violent effervescence, by HCl, 3 normal; slightly alkaline; gradual smooth boundary.

Bk2—35 to 80 inches; light brown (7.5YR 6/3) crushed, clay, brown (7.5YR 5/4) crushed, moist; 40 percent clay; moderate coarse prismatic structure; extremely hard, very firm, very sticky, very plastic; 15 percent fine irregular carbonate masses throughout; violent effervescence, by HCl, 3 normal; slightly alkaline.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Particle-size control section (weighted average):

Clay content: 40 to 60 percent

A horizon:

Hue: 7.5YR or 10YR

Value: 6 or 7 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Bw horizon:

Hue: 7.5YR or 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Texture: clay or silty clay

Bk horizon:

Hue: 7.5YR or 10YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Calcium carbonate equivalent: 5 to 15 percent (less than 2mm fraction)

Cavalry Series

The soils in the Cavalry series are classified as coarse-loamy, mixed, superactive, thermic Typic Calciargids. These very deep, well drained, moderately rapidly permeable soils formed in alluvium modified by eolian sands. The soils are on alluvial flats on basin floors. Slope is 1 to 3 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Cavalry loamy fine sand in an area of Cavalry loamy fine sand, 1 to 3 percent slopes; in El Paso County, Texas; approximately 1 mile northwest of Biggs Army Airfield. USGS El Paso topographic quadrangle; latitude 31 degrees 51 minutes 20.4 seconds north and longitude 106 degrees 23 minutes 48.03 seconds west. UTM zone 13, 367859E, 3525100N; NAD 27.

A—0 to 3 inches; brown (7.5YR 5/4) crushed, loamy fine sand, brown (7.5YR 4/4) crushed, moist; 6 percent clay; single grain; loose, noncemented, nonsticky, nonplastic; few fine roots throughout; 5 percent nonflat rounded 0.1 to 1.0 inch mixed igneous rock fragments; slight effervescence, by HCl, 1 normal; moderately alkaline, pH 7.9, Phenol red; 2 percent calcium carbonate equivalent; abrupt smooth boundary.

Bt—3 to 14 inches; brown (7.5YR 5/4) crushed, fine sandy loam, brown (7.5YR 4/4) crushed, moist; 10 percent clay; weak coarse prismatic structure; very friable, soft, noncemented, nonsticky, nonplastic; few fine roots throughout; few fine tubular pores; 45 percent discontinuous distinct clay bridging between sand grains; 5 percent nonflat rounded 0.1 to 1.0 inch mixed igneous rock fragments; slight effervescence, by HCl, 1 normal; moderately alkaline, pH 8.0, Phenol red; 3 percent calcium carbonate equivalent; clear smooth boundary.

Btk—14 to 27 inches; brown (7.5YR 5/4) crushed, fine sandy loam, brown (7.5YR 4/4) crushed, moist; 12 percent clay; weak coarse prismatic structure; very friable, soft, noncemented, nonsticky, nonplastic; few fine roots throughout; few fine tubular pores; 45 percent discontinuous distinct clay bridging between sand grains; 3 percent fine irregular weakly cemented carbonate nodules throughout; 5 percent nonflat rounded 0.1 to 1.0 inch mixed igneous rock fragments; strong effervescence, by HCl, 1 normal; slightly alkaline, pH 7.6, Phenol red; 3 percent calcium carbonate equivalent; abrupt irregular boundary.

Bk1—27 to 48 inches; pink (7.5YR 7/3) crushed, fine sandy loam, pink (7.5YR 7/4) crushed, moist; 14 percent clay; moderate medium subangular blocky structure; friable, very hard, noncemented, slightly sticky, slightly plastic; few fine roots throughout; few fine tubular pores; 85 percent fine irregular carbonate masses throughout; 5 percent nonflat rounded 0.1 to 1.0 inch mixed igneous rock fragments; violent effervescence, by HCl, 1 normal; slightly alkaline, pH 7.8, Phenol red; 22 percent calcium carbonate equivalent; gradual smooth boundary.

Bk2—48 to 80 inches; pink (7.5YR 7/3) crushed, sandy clay loam, light brown (7.5YR 6/4) crushed, moist; 20 percent clay; moderate medium subangular blocky structure; friable, very hard, noncemented, slightly sticky, slightly plastic; few fine roots throughout; few fine tubular pores; 75 percent fine irregular carbonate masses throughout; 5 percent nonflat rounded 0.1 to 1.0 inches mixed igneous rock fragments; violent effervescence, by HCl, 1 normal; slightly alkaline, pH 7.8, Phenol red; 16 percent calcium carbonate equivalent.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to calcic horizon: 20 to 40 inches

Particle-size control section (weighted average):

Clay content: 8 to 18 percent

Rock fragments: 0 to 10 percent

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 to 4, dry or moist

Rock fragments: mixed igneous rock fragments; 0 to 10 percent gravel-sized rock fragments

Clay content: 3 to 15 percent

Bt horizon

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 to 4, dry or moist

Coarse fragment: mixed igneous rock fragments; 0 to 10 percent gravel-sized rock fragments

Clay content: 8 to 18 percent

Btk horizon

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 to 4, dry or moist

Coarse fragment: mixed igneous fragment; 0 to 10 percent gravel-sized rock fragments

Clay content: 8 to 18 percent

Bk horizon

Value: 6 to 8 dry, 4 to 7 moist

Chroma: 1 to 4 dry, 2 to 4 moist

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

Clay content: 8 to 25 percent

Calcium carbonates equivalent: 15 to 40 percent

Chaparral Series

The soils in the Chaparral series are classified as coarse-loamy, mixed, superactive, thermic Ustic Haplocambids. These very deep, well drained, moderately rapidly permeable soils formed in gravelly alluvium. The soils are on alluvial fans. Slope is 2 to 5 percent. Elevation is 3,950 to 4,500 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Chaparral gravelly sandy loam in an area of Chaparral gravelly sandy loam, 2 to 5 percent slopes; in Dona Ana County, New Mexico; approximately 7.5 miles south and 3 miles east of White Sands; 2,400 feet east and 900 feet north of the southwest corner of sec. 27, T. 23 S., R. 5 E. USGS Davies Tank, NM topographic quadrangle; latitude 32 degrees 16 minutes 24.33 seconds north and longitude 106 degrees 25 minutes 11.84 seconds west. UTM zone 13, 366268E, 3571440N; NAD 27.

A—0 to 7 inches; yellowish brown (10YR 5/4) crushed, gravelly sandy loam, dark yellowish brown (10YR 3/4) crushed, moist; 10 percent clay; moderate medium granular structure; nonsticky, nonplastic; common very fine roots; 15 percent subangular 0.1- to 1-inch mixed igneous rock fragments; noneffervescent, by HCl, 1 normal; slightly alkaline; clear smooth boundary.

Bw1—7 to 16 inches; yellowish brown (10YR 5/4) crushed, gravelly sandy loam, dark yellowish brown (10YR 4/4) crushed, moist; 10 percent clay; moderate very fine subangular blocky structure; nonsticky, nonplastic; few very fine roots; 15 percent subangular 0.1- to 0.8-inch mixed igneous rock fragments; noneffervescent, by HCl, 1 normal; slightly alkaline; gradual smooth boundary.

Bw2—16 to 25 inches; brown (7.5YR 5/4) crushed, gravelly sandy loam, brown (7.5YR 4/4) crushed, moist; 10 percent clay; moderate very fine subangular blocky structure; nonsticky, nonplastic; few very fine roots; 20 percent subangular 0.1- to 1-inch mixed igneous rock fragments; noneffervescent, by HCl, 1 normal; slightly alkaline; gradual smooth boundary.

Bw3—25 to 36 inches; brown (7.5YR 5/4) crushed, gravelly sandy loam, brown (7.5YR 4/4) crushed, moist; 10 percent clay; moderate very fine subangular blocky structure; nonsticky, nonplastic; few very fine roots; 5 percent subangular 3- to 10-inch mixed igneous rock fragments and 25 percent subangular 0.1- to 1-inch mixed igneous rock fragments; noneffervescent, by HCl, 1 normal; slightly alkaline; gradual smooth boundary.

C1—36 to 45 inches; yellowish brown (10YR 5/4) crushed, gravelly loamy sand, dark yellowish brown (10YR 4/4) crushed, moist; 5 percent clay; single grain; nonsticky, nonplastic; few very fine roots; 25 percent subangular 0.1- to 1-inch mixed igneous rock fragments; slight effervescence, by HCl, 1 normal; slightly alkaline; abrupt smooth boundary.

C2—45 to 52 inches; yellowish brown (10YR 5/4) crushed, gravelly coarse sand, dark yellowish brown (10YR 4/4) crushed, moist; 2 percent clay; single grain; nonsticky, nonplastic; 25 percent subangular 0.1- to 1-inch mixed igneous rock fragments; noneffervescent, by HCl, 1 normal; slightly alkaline; abrupt smooth boundary.

C3—52 to 80 inches; light brown (7.5YR 6/4) crushed, gravelly sandy loam, brown (7.5YR 4/4) crushed, moist; 10 percent clay; massive; nonsticky, nonplastic; 5 percent subangular 3- to 10-inch mixed igneous rock fragments and 20 percent subangular 0.1- to 1-inch mixed igneous rock fragments; slight effervescence, by HCl, 1 normal; slightly alkaline.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The soil moisture control section is usually dry in

all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Particle-size control section (weighted average):

Clay content: 5 to 12 percent

Rock fragments: 15 to 35 percent

A horizon:

Value: 4 to 6 dry, 3 to 6 moist

Chroma: 2 to 4, dry or moist

Bw horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

Rock fragments: mixed igneous rock fragments; 15 to 35 percent gravel, 0 to 5 percent cobbles

C horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

Rock fragments: mixed igneous rock fragments; 15 to 35 percent gravel, 0 to 5 percent cobbles

Texture: sandy loam, loamy sand, or coarse sand

Chipotle Series

The soils in the Chipotle series are classified as sandy-skeletal, mixed, thermic Ustic Torrifluvents. These very deep, well drained, moderately rapidly permeable soils formed in alluvium from tuff. The soils are on inset fans of the fan piedmont. Slope is 0 to 3 percent. Elevation is 5,000 to 5,700 feet. Mean annual precipitation is about 11 inches, the mean annual temperature is about 62 degrees F, and the frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Chipotle extremely gravelly sandy clay loam in an area of Chipotle extremely gravelly sandy clay loam, 0 to 3 percent slopes; in Dona Ana County, New Mexico; approximately 3.1 miles west and 9.3 miles south of White Sands; 2,220 feet east and 1,380 feet south of the northwest corner of sec. 9, T. 24 S., R. 4 E. USGS Bishop Cap topographic quadrangle; latitude 32 degrees 14 minutes 19.00 seconds north and longitude 106 degrees 32 minutes 23.00 seconds west. UTM zone 13, 354952E, 3567950N; NAD 27.

A—0 to 4 inches; dark reddish gray (5YR 4/2) crushed, extremely gravelly sandy clay loam, very dark gray (5YR 3/1) crushed, moist; 24 percent clay; moderate

fine granular and weak fine subangular blocky structure; loose; slightly sticky and nonplastic; common fine roots throughout; 60 percent nonflat subrounded indurated 0.1- to 3-inch tuff gravel and 10 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; neutral, pH 6.7, pH meter 1:1 water; gradual smooth boundary.

2C1—4 to 17 inches; reddish brown (5YR 4/3) crushed, extremely gravelly sandy loam, dark reddish brown (5YR 3/3) crushed, moist; 10 percent clay; massive; soft, very friable; nonsticky and nonplastic; very few fine roots throughout; very few fine dendritic tubular pores; 60 percent nonflat subrounded indurated 0.1- to 3-inch tuff gravel; 5 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles and 5 percent nonflat subrounded indurated 10- to 24-inch tuff stones; noneffervescent, by HCl, 1 normal; slightly acid, pH 6.5, pH meter 1:1 water; gradual smooth boundary.

3C2—17 to 52 inches; reddish brown (5YR 4/3) crushed, extremely gravelly sand, dark reddish brown (5YR 3/4) crushed, moist; 2 percent clay; massive; loose; nonsticky and nonplastic; very few fine roots throughout; 60 percent nonflat subrounded indurated 0.1- to 3-inch tuff gravel; 5 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles and 5 percent nonflat subrounded indurated 10- to 24-inch tuff stones; noneffervescent, by HCl, 1 normal; slightly acid, pH 6.4, pH meter 1:1 water; diffuse smooth boundary.

4C3—52 to 64 inches; reddish brown (5YR 4/3) crushed, very cobbly sandy clay loam, dark reddish brown (5YR 3/4) crushed, moist; 24 percent clay; massive; slightly hard, very friable; slightly sticky and slightly plastic; very few fine roots throughout; 5 percent nonflat subrounded indurated 0.1- to 3-inch tuff gravel; 35 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles and 10 percent nonflat subrounded indurated 10- to 24-inch tuff stones; noneffervescent, by HCl, 1 normal; neutral, pH 6.9, pH meter 1:1 water; abrupt smooth boundary.

5C4—64 to 80 inches; reddish brown (5YR 4/4) crushed, extremely gravelly sandy loam, reddish brown (5YR 4/3) crushed, moist; 12 percent clay; massive; soft, very friable; slightly sticky and slightly plastic; 80 percent nonflat subrounded indurated 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; neutral, pH 6.7, pH meter 1:1 water.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Particle-size control section (weighted average):

Clay content: 2 to 8 percent

Rock fragments: 55 to 85 percent

Reaction: slightly acid to neutral

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 2.5 or 3 moist

Chroma: 1 to 3, dry or moist

Texture modifier: very gravelly or extremely gravelly

Rock fragments: tuff rock fragments; 50 to 75 percent total rock fragments; 45 to 75 percent gravel; 5 to 20 percent cobbles

C horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 2.5 to 4 moist

Chroma: 2 to 4, dry or moist

Texture modifier: very gravelly, extremely gravelly, or very cobbly

Rock fragments: tuff rock fragments; 55 to 80 percent total rock fragments; 5 to 80 percent gravel; 0 to 35 percent cobbles; 0 to 10 percent stones

Texture: sand, sandy loam, or sandy clay loam

Chuzzie Series

The soils in the Chuzzie series are classified as loamy-skeletal over sandy or sandy-skeletal, mixed, superactive, thermic Pachic Haplustolls. These very deep, well drained, moderately slowly over rapidly permeable soils formed in alluvium from tuff and monzonite. The soils are on stream terraces. Slope is 0 to 3 percent. Elevation is 4,700 to 6,300 feet. Mean annual precipitation is about 14 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Chuzzie very gravelly loam in an area of Chuzzie very gravelly loam, 0 to 3 percent slopes; in Dona Ana New Mexico; approximately 3.6 miles west and 5.5 miles south of White Sands; 1,000 feet west and 2,050 feet north of the southeast corner of sec. 21, T. 23 S., R. 4 E. USGS Organ Peak topographic quadrangle; latitude 32 degrees 17 minutes 30.65 seconds north and longitude 106 degrees 32 minutes 35.34 seconds west. UTM zone 13, 354645E, 3573560 N; NAD 27.

A—0 to 2 inches; dark reddish gray (5YR 4/2) crushed, very gravelly loam, dark reddish brown (5YR 2.5/2) crushed, moist; 14 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and

nonplastic; few fine roots throughout; few fine dendritic tubular pores; 50 percent nonflat subrounded indurated 0.1- to 3-inch monzonite gravel and 5 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; strongly acid; clear smooth boundary.

C1—2 to 8 inches; dark reddish gray (5YR 4/2) crushed, dark reddish brown (5YR 2.5/2) crushed, moist; very gravelly loam; 14 percent clay; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots throughout; few fine dendritic tubular pores; 30 percent nonflat subrounded indurated 0.1- to 3-inch monzonite gravel and 5 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; slightly acid; gradual smooth boundary.

C2—8 to 16 inches; dark reddish gray (5YR 4/2) crushed, very gravelly loam, dark reddish brown (5YR 2.5/2) crushed, moist; 16 percent clay; moderate medium subangular blocky structure; soft very friable; slightly sticky and slightly plastic; common fine roots throughout; few fine dendritic tubular pores; 30 percent nonflat subrounded indurated 0.1- to 3-inch monzonite rock fragments; 5 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; slightly acid; abrupt wavy boundary.

2C3—16 to 34 inches; reddish brown (5YR 4/3) crushed, extremely gravelly loamy sand, dark reddish brown (5YR 3/2) crushed moist; 10 percent clay; massive; loose; nonsticky and nonplastic; few fine roots throughout; few fine dendritic tubular pores; 60 percent nonflat subrounded indurated 0.1- to 3-inch monzonite gravel; 20 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; slightly acid; clear wavy boundary.

2C4—34 to 80 inches; reddish brown (5YR 4/4) crushed, extremely gravelly sand, dark reddish brown (5YR 3/4) crushed moist; 4 percent clay; massive; loose; nonsticky and nonplastic; very few fine roots throughout; 60 percent nonflat subrounded indurated 0.1- to 3-inch monzonite gravel and 30 percent nonflat subrounded indurated 3- to 10-inch monzonite cobbles; noneffervescent, by HCl, 1 normal; slightly acid.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.
Thickness of mollic epipedon: 20 to 40 inches

Particle-size control section (weighted average):

Clay content: 10 to 18 percent

Rock fragments: 60 to 80 percent

Reaction: strongly acid to slightly acid

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Rock fragments: mixed igneous rock fragments; 35 to 60 percent rock fragments, 35 to 55 percent gravel, 0 to 10 percent cobbles

C horizons:

Hue: 5YR or 7.5YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Rock fragments: 35 to 50 percent total rock fragments, 25 to 40 percent gravel, 0 to 10 percent cobbles

Texture: loam or sandy loam

2C horizons:

Hue: 5YR to 7.5YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 4, dry or moist

Rock fragments: 65 to 90 percent total rock fragments, 50 to 70 percent gravel, 15 to 35 percent cobbles

Texture: loamy sand or sand

Condron Series

The soils in the Condron series are classified as fine-loamy, mixed, superactive, thermic Ustic Haplargids. These very deep, well drained, moderately permeable soils formed in eolian sands over alluvium from mixed igneous sources. These nearly level to gently sloping soils are on inset fans of the fan piedmont. Slope is 2 to 5 percent. Elevation is 4,200 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Condron sand in an area of Condron sand, 2 to 5 percent slopes; in Dona Ana County, New Mexico; approximately 6.8 miles south and 3.1 miles east of White Sands; 2,300 feet east and 500 feet north of the southwest corner of sec. 22, T. 23 S., R. 5 E. USGS Davies Tank topographic quadrangle; latitude 32 degrees 17 minutes 12.55 seconds north and longitude 106 degrees 25 minutes 12.45 seconds west. UTM zone 13, 366273E, 3572924N; NAD 27.

A—0 to 2 inches; brown (7.5YR 5/4) crushed, sand, dark brown (7.5YR 3/4) crushed, moist; 3 percent clay; single grain; nonsticky, nonplastic; noneffervescent, by HCl, 1 normal; abrupt smooth boundary.

2Bt1—2 to 11 inches; reddish brown (5YR 5/4) crushed, sandy loam, dark reddish brown (5YR 3/4) crushed, moist; 14 percent clay; moderate fine subangular blocky structure; slightly sticky, slightly plastic; carbonate coats on rock fragments and 20 percent discontinuous distinct clay films on all faces of peds; 10 percent subangular 0.1- to 3-inch rock fragments; noneffervescent, by HCl, 1 normal; clear smooth boundary.

2Bt2—11 to 19 inches; reddish brown (2.5YR 4/4) crushed, sandy clay loam, dark reddish brown (2.5YR 3/4) crushed, moist; 24 percent clay; moderate fine subangular blocky structure; moderately sticky, moderately plastic; carbonate coats on rock fragments and 35 percent discontinuous distinct clay films on all faces of peds; 12 percent subangular 0.1- to 3-inch rock fragments; noneffervescent, by HCl, 1 normal; clear smooth boundary.

2Bt3—19 to 30 inches; reddish brown (2.5YR 5/4) crushed, sandy clay loam, dark reddish brown (2.5YR 3/4) crushed, moist; 24 percent clay; moderate fine subangular blocky structure; moderately sticky, moderately plastic; carbonate coats on rock fragments and 20 percent discontinuous distinct clay films on all faces of peds; 10 percent subangular 0.1- to 3-inch rock fragments; noneffervescent, by HCl, 1 normal; clear smooth boundary.

3Bt4—30 to 80 inches; yellowish red (5YR 4/6) crushed, very gravelly sandy clay loam, dark reddish brown (5YR 3/4) crushed, moist; 27 percent clay; moderate fine subangular blocky structure; moderately sticky, moderately plastic; carbonate coats on rock fragments and 50 percent discontinuous prominent clay films on all faces of peds; 50 percent subangular 0.1- to 3-inch rock fragments; strong effervescence, by HCl, 1 normal.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Depth to argillic horizon: 1 to 4 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 5 to 15 percent

A horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 3 to 5, dry or moist

Bt horizon:

Hue: 2.5YR or 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 4 to 6 dry, 4 or 5 moist

Texture: sandy loam or sandy clay loam

Texture modifier: gravelly or very gravelly

Rock fragments: mixed igneous rock fragments; 5 to 55 percent gravel-sized rock fragments

Copia Series

The soils in the Copia series are classified as mixed, thermic Typic Torripsamments. These very deep, excessively drained, moderately rapidly permeable soils formed in alluvium and eolian sediments from mixed sources. The soils are on dunes and shrub-coppice dunes. Slope is 2 to 15 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Copia loamy fine sand in an area of Copia loamy fine sand, 5 to 15 percent slopes; in Otero County, New Mexico; approximately 4.4 miles east and 3.1 miles north of Orogrande; NE1/4, SE1/4 of sec. 4, T.22 S., R.9 E.; 106 degrees 01 minutes 15 seconds west longitude and 32 degrees 25 minutes 13 seconds north latitude. UTM zone 13, 404018E, 3587293N; NAD 27.

A—0 to 9 inches; reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 4/6) moist; single grained; loose; many very fine roots; noneffervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear smooth boundary.

C1—9 to 24 inches; reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 4/6) moist; single grained; loose; common very fine roots; noneffervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear smooth boundary.

C2—24 to 33 inches; reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 4/6) moist; single grained; loose; few fine roots; noneffervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear smooth boundary.

C3—33 to 51 inches; reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 4/6) moist; single grained; loose; few very fine roots; noneffervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear smooth boundary.

C4—51 to 71 inches; reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 4/6) moist; single grained; loose; few very fine and few fine roots; noneffervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear smooth boundary.

2Btkb—71 to 80 inches; reddish yellow (5YR 6/8) loamy fine sand, red (2.5YR 4/8) moist; single grained; loose; few very fine roots; sand grains coated with clay; strong effervescence, by HCl, 1 normal; slightly alkaline, pH 7.6.

Range in Characteristics

Soil moisture: A typical aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Texture: Dominantly sand or loamy fine sand throughout. Thin horizons of loamy sand may be present in some pedons, but texture in the particle size control section averages sand or loamy fine sand with less than 11 percent silt plus clay.

A horizon:

Hue: 5YR or 7.5YR

Value: 3 to 6 dry, 2 to 5 moist

Chroma: 6 to 8, dry or moist

C horizon:

Hue: 2.5YR, 5YR, or 7.5YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 6 to 8, dry or moist

2Bt horizon not present in all pedons

Crossen Series

The soils in the Crossen series are classified as loamy, carbonatic, thermic, shallow Calcic Petrocalcids. These very shallow and shallow, well drained soils formed in colluvium and alluvium from limestone. Permeability is moderately slow above the very slowly permeable petrocalcic horizon. The soils are on fan remnants. Slope is 1 to 5 percent. Elevation is 4,200 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Crossen gravelly fine sandy loam in

an area of Crossen-Tinney complex, 1 to 3 percent slopes; in Otero County, New Mexico; approximately 11.5 miles south and 3.4 miles east of Orogrande; in an unsectionalized area. USGS Desert NE topographic quadrangle; latitude 32 degrees 12 minutes 34.00 seconds north and longitude 106 degrees 1 minute 41.00 seconds west. UTM zone 13, 403124E, 3563913N; NAD 27.

A—0 to 2 inches; brown (7.5YR 5/3) crushed, gravelly fine sandy loam, dark brown (7.5YR 3/3) crushed, moist; 14 percent clay; moderate very fine granular structure; very friable, soft, nonsticky, nonplastic; common fine roots throughout and common very fine roots throughout; 95 percent discontinuous prominent carbonate coats on rock fragments; 20 percent subangular 0.1- to -3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; abrupt smooth boundary.

Bk1—2 to 7 inches; light brown (7.5YR 6/4) crushed, gravelly fine sandy loam, brown (7.5YR 4/4) crushed, moist; 14 percent clay; strong medium prismatic parts to moderate medium subangular blocky structure; very friable, soft, nonsticky, nonplastic; common fine roots throughout and common very fine roots throughout; 95 percent discontinuous prominent carbonate coats on rock fragments; 20 percent subangular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

Bk2—7 to 15 inches; light brown (7.5YR 6/4) crushed, gravelly fine sandy loam, brown (7.5YR 4/4) crushed, moist; 14 percent clay; moderate coarse prismatic parts to moderate medium subangular blocky structure; very friable, soft, nonsticky, nonplastic; common fine roots throughout and common very fine roots throughout; 95 percent discontinuous prominent carbonate coats on rock fragments; 20 percent subangular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; abrupt smooth boundary.

Bkm—15 to 28 inches; white (7.5YR 8/1) broken face; structure; indurated, cemented by carbonates; violent effervescence, by HCl, 1 normal; clear smooth boundary.

Bck1—28 to 39 inches; pink (7.5YR 7/3) crushed, extremely gravelly loam, light brown (7.5YR 6/4) crushed, moist; 12 percent clay; massive; strongly cemented by carbonates; 60 percent discontinuous prominent carbonate coats on rock fragments; 5 percent subangular 3- to 10-inch limestone rock fragments and 55 percent subangular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

Bck2—39 to 80 inches; pink (7.5YR 7/3) crushed, extremely gravelly sandy loam, light brown (7.5YR 6/4) crushed, moist; 10 percent clay; massive; very strongly cemented by carbonates; 35 percent discontinuous prominent carbonate coats on bottom surfaces of rock fragments; 10 percent subangular 3- to 10-inch limestone rock fragments and 50 percent subangular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal.

Range in Characteristics

Soil moisture: an aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Depth to petrocalcic horizon: 6 to 20 inches.

Mean annual soil temperature: 61 to 65 degrees F.

Particle-size control section (weighted average):

Clay content: 14 to 25 percent

Rock fragments: 15 to 35 percent

Calcium carbonate equivalent: ranges from 35 to 70 percent, but averages 40 to 60 percent in the control section

A horizon:

Hue: 7YR or 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Bk horizon:

Hue: 7.5YR or 10YR

Value: 4 to 6, dry or moist

Chroma: 2 to 4, dry or moist

Other features: coatings of calcium carbonate on rock fragments range from common to many

Bkm horizon:

Pan features: laminar and indurated in the upper part and indurated to strongly cemented in the lower part.

Bck horizon:

Hue: 7.5YR or 10YR

Value: 4 to 7, dry or moist

Chroma: 2 to 4, dry or moist

Texture of the fine earth fraction: loam or clay loam

Rock fragments: 15 to 60 percent

Crotalus Series

The soils in the Crotalus series are classified as loamy-skeletal, carbonatic, thermic Ustic Haplocalcids. These very deep, well drained, moderately slowly permeable soils formed in colluvium from tuff modified

by eolian material. The soils are on mountain flanks and bases. Slope is 15 to 35 percent. Elevation is 4,000 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Crotalus extremely gravelly loam in an area of Crotalus extremely gravelly loam, 15 to 35 percent slopes; in Dona Ana County, New Mexico; approximately 5.1 miles west and 9.8 miles south of White Sands, 220 feet west and 190 feet north of the southeast corner of sec. 7, T. 24 S., R. 4 E. USGS Bishop Cap topographic quadrangle; latitude 32 degrees, 13 minutes, 6.96 seconds north and longitude 106 degrees 33 minutes 8.46 seconds west. UTM zone 13S, 352621E, 3566750N; NAD 27.

A—0 to 2 inches; brown (7.5YR 5/4) crushed, extremely gravelly loam, dark brown (7.5YR 3/4) crushed, moist; 22 percent clay; weak fine granular structure; loose; slightly sticky and slightly plastic; few fine roots throughout; 40 percent gravel, 15 percent cobbles and 15 percent stones; strong effervescence, by HCl, 1 normal; neutral; gradual smooth boundary.

Bk1—2 to 8 inches; brown (7.5YR 4/4) crushed, very cobbly loam, dark brown (7.5YR 3/4) crushed, moist; 25 percent clay; moderate fine subangular blocky structure; slightly hard, friable; moderately sticky and moderately plastic; few fine roots throughout; few fine dendritic tubular pores, 5 percent fine spherical carbonate masses on faces of peds; 20 percent nonflat subrounded indurated 0.1- to 3-inch tuff gravel and 15 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles; strong effervescence, by HCl, 1 normal; slightly alkaline; gradual wavy boundary.

Bk2—8 to 27 inches; brown (7.5YR 5/4) crushed, extremely gravelly loam, brown (7.5YR 4/4) crushed, moist; 27 percent clay; moderate fine subangular blocky structure; slightly hard, friable; moderately sticky and moderately plastic; few fine roots throughout; few fine dendritic tubular pores; 10 percent fine irregular carbonate masses on faces of peds; 40 percent nonflat subrounded indurated 0.1- to 3-inch tuff gravel, 15 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles and 10 percent nonflat subrounded indurated 10- to 24-inch tuff stones; strong effervescence, by HCl, 1 normal; slightly alkaline; clear wavy boundary.

Bk3—27 to 45 inches; pink (7.5YR 8/3) crushed, extremely gravelly clay loam, light brown (7.5YR 6/4)

crushed, moist; 28 percent clay; moderate medium subangular blocky structure; slightly hard, friable; moderately sticky and moderately plastic; very few fine roots throughout; few fine dendritic tubular pores; 100 percent coarse irregular carbonate masses in matrix; 40 percent nonflat subrounded indurated 0.1- to 3-inch tuff gravel and 20 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles; violent effervescence, by HCl, 1 normal; slightly alkaline; gradual wavy boundary.

Bk4—45 to 80 inches; pink (7.5YR 7/3) crushed, extremely gravelly clay loam, light brown (7.5YR 6/4) crushed, moist; 32 percent clay; weak fine subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; very few fine roots throughout; 40 percent medium irregular carbonate masses on faces of peds; 60 percent nonflat subrounded indurated 0.1- to 3-inch tuff gravel and 15 percent nonflat subrounded indurated 3- to 10-inch tuff cobbles; violent effervescence, by HCl, 1 normal; slightly alkaline.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Depth to calcic horizon: 20 to 35 inches

Particle-size control section (weighted average):

Clay content: 25 to 35 percent

Rock fragments: 60 to 75 percent

Reaction: slightly alkaline to moderately alkaline

Calcium carbonate equivalent: 40 to 55 percent (less than 20mm fraction)

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 4 or 6, dry or moist

Rock fragments: tuff rock fragments; 35 to 65 percent gravel; 5 to 15 percent cobbles; 5 to 15 percent stones

Bk horizons:

Hue: 5YR or 7.5YR

Value: 4 to 8 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Texture modifier: very gravelly or extremely gravelly

Rock fragments: 35 to 85 percent total rock fragments; 20 to 70 percent gravel; 10 to 25 percent cobbles; 0 to 10 percent stones.

Texture: loam or clay loam

Deama Series

The soils in the Deama series are classified as loamy-skeletal, carbonatic, mesic Lithic Calciustolls. These very shallow and shallow, well drained, moderately slowly permeable soils formed in colluvium from limestone. The soils are on hills. Slope is 5 to 65 percent. Elevation is 5,500 to 6,800 feet. Mean annual precipitation is about 15 inches, and the mean annual temperature is about 56 degrees F. The frost-free period is 130 to 170 days.

Typical Pedon

Typical pedon of Deama very cobbly loam in an area of Deama-Penalto-Rock outcrop complex, 5 to 15 percent slopes; in Otero County, New Mexico; approximately 3.75 miles south and 1.8 miles west of Timberon; 2,600 feet west and 2,200 feet north of the southeast corner of sec. 9, T. 20 S., R. 12 E. USGS El Paso Canyon topographic quadrangle; latitude 32 degrees 34 minutes 55.76 seconds north and longitude 105 degrees 43 minutes 11.65 seconds west. UTM zone 13,432432E, 3605005N; NAD 27.

A—0 to 2 inches; brown (7.5YR 4/3) crushed, very cobbly loam, dark brown (7.5YR 3/2) crushed, moist; 24 percent clay; weak fine subangular blocky parts to moderate very fine granular structure; very friable, soft, slightly sticky, slightly plastic; common very fine roots throughout; 5 percent angular 10- to 20-inch limestone rock fragments and 25 percent angular 3- to 10-inch limestone rock fragments and 25 percent angular 0.1- to 3-inch limestone rock fragments; strong effervescence, by HCl, 1 normal; clear smooth boundary.

Bk1—2 to 8 inches; brown (7.5YR 4/2) crushed, very cobbly loam, dark brown (7.5YR 3/2) crushed, moist; 24 percent clay; moderate medium subangular blocky structure; very friable, soft, slightly sticky, slightly plastic; few medium roots throughout and common very fine roots throughout; continuous prominent carbonate coats on rock fragments; 10 percent fine irregular carbonate masses throughout; 5 percent angular 10- to 20-inch limestone rock fragments and 25 percent angular 3- to 10-inch limestone rock fragments and 25 percent angular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; clear smooth boundary.

Bk2—8 to 11 inches; brown (7.5YR 5/4) crushed, very cobbly loam, dark brown (7.5YR 3/3) crushed, moist; 24 percent clay; weak medium subangular blocky

structure; very friable, soft, slightly sticky, slightly plastic; few medium roots throughout and few very fine roots throughout; continuous prominent carbonate coats on rock fragments; 15 percent fine irregular carbonate masses throughout; 5 percent angular 10- to 20-inch limestone rock fragments and 25 percent angular 3- to 10-inch limestone rock fragments and 25 percent angular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; abrupt smooth boundary.

R—11 inches; thickly bedded massive limestone.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Soil temperature: 55 to 59 degrees F.

Depth to bedrock: 7 to 20 inches

Depth to calcic horizon: 1 to 6 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 35 to 65 percent

Calcium carbonate equivalent: 40 to 60 percent (less than 20 mm fraction)

A horizon:

Hue: 5YR to 10YR

Value: 3 to 6 dry, 2 to 4 moist

Chroma: 2 or 3, dry or moist

Rock fragments: limestone rock fragments; 35 to 65 percent total rock fragments; 20 to 30 percent gravel; 20 to 30 percent cobbles; 0 to 5 percent stones

Bk horizon:

Hue: 5YR or 10YR

Value: 4 to 8 dry, 3 to 7 moist

Chroma: 2 to 4, dry or moist

Rock fragments: limestone rock fragments; 35 to 65 percent total rock fragments; 20 to 30 percent gravel; 20 to 30 percent cobbles; 0 to 5 percent stones

Delnorte Series

The soils in the Delnorte series are classified as loamy-skeletal, mixed, superactive, thermic, shallow Typic Petrocalcids. These very shallow and shallow, well drained, moderately permeable soils formed in alluvium. The soils are on fan piedmonts. Slope is 3 to

15 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Delnorte very gravelly loam, in El Paso County, Texas; from the junction of Interstate 10 and Trans-mountain Road at Canutillo Texas, 2.4 miles east on Trans-mountain Road 100 feet south in range. Latitude 31 degrees, 54 minutes, 18 seconds north and longitude 106 degrees, 32 minutes, 20 seconds west. UTM zone 13, 354402E, 3530702N; NAD 27.

Ak—0 to 8 inches; pinkish gray (7.5YR 6/2) very gravelly loam, brown (7.5YR 4/3) moist; weak granular structure; slightly hard, friable; 50 percent angular and subrounded igneous gravel that are coated with calcium carbonate; rock fragments are mostly less than 2 inches in diameter; few rounded cobbles; few fine roots; strong effervescence; moderately alkaline; abrupt wavy boundary.

Bk—8 to 12 inches; pinkish gray (7.5YR 6/2) extremely gravelly loam, brown (7.5YR 5/2) moist; weak fine and medium granular and subangular blocky structure; very hard, friable; many fine roots; 80 percent moderately to strongly cemented calcium carbonate; 75 percent angular and subrounded igneous gravel that are coated with calcium carbonates; violent effervescence; moderately alkaline; abrupt wavy boundary.

Bkm—12 to 20 inches; very pale brown (10YR 8/2) indurated caliche; upper 5 inches is laminar, containing few brownish bands, few fractures; in the lower part of the caliche is massive and less hard with depth and contains imbedded igneous gravel.

Bck—20 to 80 inches; very pale brown (10YR 7/3) extremely gravelly fine sand, pale brown (10YR 6/3) moist; single grain; loose; 80 percent subrounded limestone and igneous gravel mostly less than 2 inches in diameter, that are coated with calcium carbonate, strong effervescence, moderately alkaline.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to petrocalcic horizon: 6 to 20 inches

Particle-size control section (weighted average):

Clay content: 5 to 25 percent

Rock fragments: 35 to 75 percent

Calcium carbonate equivalent: 15 to 40 percent (less than 2 mm fraction)

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

Rock fragments: mixed igneous rock fragments; 25 to 75 percent gravel size rock fragments

Bk horizon:

Hue: 7.5YR or 10YR

Value: 5 to 8 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

Texture: fine sandy loam, sandy loam, or loam

Texture modifier: very gravelly or extremely gravelly

Rock fragments: mixed igneous rock fragments; 35 to 85 percent gravel size rock fragments

BCK horizon:

Hue: 7.5YR or 10YR

Value: 5 to 8 dry, 5 or 6 moist

Chroma: 2 or 3, dry or moist

Texture: sandy loam, sand, or fine sand

Texture modifier: very gravelly or extremely gravelly

Rock fragments: mixed igneous rock fragments; 35 to 85 percent gravel size rock fragments

Double Series

The soils in the Double series is classified as fine-loamy, mixed, superactive, thermic Ustic Haplocambids. These very deep, well drained, moderately slowly permeable soils that formed in calcareous alluvium. The soils are on alluvial fans. Slope is 2 to 5 percent. Elevation is 4,700 to 6,000 feet. Mean annual precipitation is about 13 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Double silt loam in an area of Double silt loam, 2 to 5 percent slopes; in Otero County, New Mexico; approximately 6.8 miles north and 19.8 miles east of Orogrande; 2,300 feet south and 1,050 feet east of the northwest corner of sec. 17, T. 21 S., R. 12 E. USGS El Paso Draw, NM topographic quadrangle; latitude 32 degrees 28 minutes 47.8 seconds north and longitude 105 degrees 44 minutes 45.78 seconds west. UTM zone 13, 429902E, 3593694N; NAD 27.

A—0 to 2 inches; light brown (7.5YR 6/3) silt loam, brown (7.5YR 4/3) moist; 24 percent clay; moderate very fine granular structure; moderately sticky, nonplastic; many fine roots and many very fine roots;

violent effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

Bw1—2 to 8 inches; brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3) moist; 27 percent clay; moderate very fine subangular blocky structure; moderately sticky, nonplastic; many fine roots and many very fine roots; few medium tubular pores; violent effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

Bw2—8 to 37 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 4/4) moist; 32 percent clay; moderate medium subangular blocky structure; moderately sticky, nonplastic; common fine roots and common very fine roots; common medium tubular pores; violent effervescence, by HCl, 1 normal; moderately alkaline; gradual smooth boundary.

Bw3—37 to 80 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; 25 percent clay; weak medium subangular blocky structure; moderately sticky, nonplastic; common very fine roots; few medium tubular pores; violent effervescence, by HCl, 1 normal; moderately alkaline.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The soil moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Particle-size control section (weighted average):

Clay content: 27 to 35 percent

Rock fragments: 0 to 5 percent

A horizon:

Value: 4 to 6 dry, 3 to 6 moist

Chroma: 2 to 4, dry or moist

Bw horizon:

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

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

Rock fragments: limestone rock fragments; 0 to 5 percent gravel

Dozer Series

The soils in the Dozer series are classified as loamy-skeletal, carbonatic, thermic Lithic Torriorthents. These very shallow and shallow, well drained, moderately slowly permeable soils formed in colluvium over limestone. The soils are on hills. Slope is 5 to 65 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual

temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Dozer extremely cobbly loam in an area of Dozer-Rock outcrop complex, 15 to 35 percent slopes; in Otero County, New Mexico; approximately 1.2 miles west and 25.4 miles south of Orogrande; NW1/4, NW1/4 sec. 35, T. 26 S., R. 8 E. USGS Desert SE topographic quadrangle; latitude 32 degrees 0 minutes 19 seconds north and longitude 106 degrees 6 minutes 6 seconds west. UTM zone 13, 395910E, 3541379N; NAD 27.

A—0 to 1 inch; pale brown (10YR 6/3) dry, crushed, extremely cobbly loam, brown (10YR 5/3) crushed, moist; moderate thin platy structure parting to moderate very fine granular; few very fine roots throughout; 19 percent clay; 30 percent subangular limestone gravel and 30 percent subangular limestone cobbles; violent effervescence, by HCl, 1 normal; moderately alkaline; abrupt smooth boundary.

C—1 to 13 inches; light gray (10YR 7/2) dry, crushed, very gravelly loam, brown (10YR 5/3) crushed, moist; massive; few very fine roots throughout; 19 percent clay; 25 percent subangular limestone gravel and 15 percent subangular limestone cobbles; violent effervescence, by HCl, 1 normal; moderately alkaline; abrupt smooth boundary.

R—13 inches, thickly bedded massive limestone.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to lithic contact: 6 to 20 inches

Particle-size control section (weighted average):

Clay content: 18 to 35 percent

Rock fragments: 35 to 65 percent

Calcium carbonate equivalent: 40 to 60 percent (less than 20 mm fraction)

A horizon:

Hue: 7.5YR to 2.5Y

Value: 5 to 8 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

Rock fragments: limestone rock fragments; 35 to 65 percent total rock fragments; 10 to 35 percent gravel; 10 to 35 percent cobbles

C horizon:

Hue: 7.5YR to 2.5Y

Value: 5 to 8 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

Texture: loam or clay loam

Texture modifier: very gravelly, very cobbly, or extremely cobbly

Rock fragments: limestone rock fragments; 35 to 65 percent total rock fragments; 10 to 35 percent gravel; 10 to 35 percent cobbles

Elizario Series

The soils in the Elizario series are classified as fine-loamy, mixed, superactive, thermic Typic Calciargids. These very deep, well drained, moderately slowly permeable soils formed in eolian sands over alluvium. The soils are on slightly depressed alluvial flats of basin floors. Slope is 2 to 5 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Elizario sand in an area of Elizario-Copia complex, 2 to 30 percent slopes; in Otero County, New Mexico, 19.9 miles west and 15.5 miles south of Orogrande; 1,600 feet east and 2,600 feet north of southwest corner of sec. 10, T. 25 S., R. 5 E. USGS Newman NW topographic quadrangle; latitude 32 degrees 8 minutes 52.09 seconds north and longitude 106 degrees 25 minutes 18.45 seconds west. UTM Zone 13, 365911E, 3557516N; NAD 27.

A—0 to 2 inches; strong brown (7.5YR 4/6) crushed, sand, brown (7.5YR 4/4) crushed, moist; 4 percent clay; single grain structure; loose, nonsticky, nonplastic; 2 percent 0.1- to 3.0- inch limestone rock fragments; noneffervescent, by HCl, 3 normal; slightly alkaline; abrupt smooth boundary.

2Btk1—2 to 6 inches; yellowish red (5YR 4/6) crushed, sandy clay loam, reddish brown (5YR 4/4) crushed, moist; 20 percent clay; weak medium subangular blocky structure; loose, nonsticky, nonplastic; few distinct clay film on faces of peds; 5 percent fine threadlike carbonate masses throughout; 1 percent 0.1- to 3.0- inch limestone rock fragments; noneffervescent, by HCl, 3 normal; slightly alkaline; abrupt smooth boundary.

2Btk2—6 to 20 inches; yellowish red (5YR 4/6) crushed, sandy clay loam, reddish brown (5YR 4/4) crushed, moist; 20 percent clay; weak medium subangular blocky structure; very friable, soft, slightly sticky, slightly plastic; few distinct clay film on faces of peds; 10 percent fine threadlike carbonate masses

throughout; 1 percent 0.1- to 3.0-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; slightly alkaline; 2 percent calcium carbonate equivalent; gradual smooth boundary.

2Btk3—20 to 31 inches; yellowish red (5YR 4/6) crushed, sandy clay loam, reddish brown (5YR 4/4) crushed, moist; 22 percent clay; weak medium subangular blocky structure; firm, moderately hard, moderately sticky, moderately plastic; few distinct clay film on faces of peds; 15 percent medium irregular carbonate masses throughout; 1 percent 0.1- to 3.0-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; moderately alkaline; 2 percent calcium carbonate equivalent; clear smooth boundary.

3Bk1—31 to 48 inches; pink (7.5YR 7/3) crushed, silt loam, light brown (7.5YR 6/4) crushed, moist; 19 percent clay; weak medium subangular blocky structure; firm, moderately hard, slightly sticky, moderately plastic; 60 percent coarse irregular carbonate masses throughout; 1 percent 0.1- to 3.0-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; moderately alkaline; 26 percent calcium carbonate equivalent; clear smooth boundary (12 to 22 inches thick).

3Bk2—48 to 59 inches; pink (7.5YR 7/4) crushed, silt loam, light brown (7.5YR 6/4) crushed, moist; 19 percent clay; massive; extremely firm, very hard, slightly sticky, moderately plastic; 5 percent fine irregular carbonate masses throughout and 35 percent extremely coarse irregular carbonate masses throughout; 1 percent 0.1- to 3.0-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; moderately alkaline; 24 percent calcium carbonate equivalent; abrupt smooth boundary.

4C—59 to 80 inches; light brown (7.5YR 6/4) crushed, sandy clay loam, brown (7.5YR 5/4) crushed, moist; 19 percent clay; massive; extremely firm, very hard, slightly sticky, moderately plastic; 10 percent medium irregular carbonate masses throughout; 1 percent 0.1- to 3.0-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; moderately alkaline; 7 percent calcium carbonate equivalent.

Range in Characteristics

Soil moisture: Typic aridic moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to calcic horizon: 20 to 40 inches

Particle-size control section (weighted average):

Clay content: 20 to 27 percent

Rock fragments: 0 to 5 percent

A horizon:

Hue: 5YR or 7.5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 4 to 6, dry or moist

Rock fragments: mixed igneous or limestone rock fragments; 0 to 5 percent gravel-sized rock fragments

2Btk horizon:

Hue: 5YR or 7.5YR

Value: 4 or 6, dry or moist

Chroma: 4 to 6, dry or moist

Rock fragments: mixed igneous or limestone rock fragments; 0 to 5 percent gravel-sized rock fragments

3Bk horizon:

Value: 6 to 8 dry, 5 or 6 moist

Chroma: 2 to 6, dry or moist

Rock fragments: mixed igneous or limestone rock fragments; 0 to 5 percent gravel-sized rock fragments

Calcium carbonate equivalent: 15 to 40 percent (less than 2 mm fraction)

C horizon:

Value: 6 to 8 dry, 5 or 6 moist

Chroma: 2 to 4, dry or moist

Rock fragments: mixed igneous or limestone rock fragments; 0 to 5 percent gravel-sized rock fragments

Enash Series

The soils in the Enash series are classified as loamy-skeletal, mixed, superactive, thermic Pachic Haplustolls. These very deep, well drained, moderately permeable soils that formed in alluvium and colluvium derived from tuff. The soils are on mountain bases. Slope is 3 to 8 percent. Elevation is 4,900 to 6,200 feet. Mean annual precipitation is about 13 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Enash very gravelly loam in an area of Enash very gravelly loam, 3 to 8 percent slopes; in Dona Ana County, New Mexico; approximately 5.3 miles west and 5.5 miles south of White Sands; 1,980 feet north and 1,760 feet east of the southwest corner of sec. 19, T. 23 S., R. 4 E. USGS Organ Peak topographic quadrangle; latitude 32 degrees 17 minutes 32.58 seconds north and longitude 106 degrees 34 minutes 11.07 seconds west. UTM zone 13, 352190E, 3573738 N; NAD 27.

A—0 to 7 inches; brown (7.5YR 4/3) crushed, very gravelly loam, very dark brown (7.5YR 2.5/2) crushed,

moist; 16 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots throughout; 50 percent flat rounded indurated 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; neutral, pH 6.6, pH meter 1:1 water; gradual smooth boundary.

C1—7 to 14 inches; brown (7.5YR 4/3) crushed, very gravelly loam, very dark brown (7.5YR 2.5/2) crushed, moist; 26 percent clay; weak medium subangular blocky structure; moderately hard, firm; slightly sticky and slightly plastic; common fine roots throughout; few fine dendritic tubular pores; 40 percent flat rounded indurated 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; slightly acid, pH 6.1, pH meter 1:1 water; gradual smooth boundary.

C2—14 to 21 inches; brown (7.5YR 4/4) crushed, very gravelly loam, dark brown (7.5YR 3/2) crushed, moist; 24 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky and slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 40 percent flat rounded indurated 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; slightly acid, pH 6.3, pH meter 1:1 water; gradual smooth boundary.

C3—21 to 35 inches; brown (7.5YR 4/3) crushed, very gravelly loam, very dark brown (7.5YR 2.5/2) crushed, moist; 22 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 35 percent flat rounded indurated 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; slightly acid, pH 6.5, pH meter 1:1 water; diffuse smooth boundary.

C4—35 to 50 inches; dark brown (7.5YR 3/4) crushed, gravelly loam; dark brown (7.5YR 3/2) crushed, moist; 22 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 30 percent flat rounded indurated 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; neutral, pH 6.8, pH meter 1:1 water; gradual smooth boundary.

C5—50 to 80 inches; brown (7.5YR 4/3) crushed, very gravelly sandy loam, dark brown (7.5YR 3/4) crushed, moist; 20 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; very few fine roots throughout; 50 percent flat rounded indurated 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; neutral, pH 7.0, pH meter 1:1 water.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Thickness of mollic epipedon: 30 to 56 inches

Particle-size control section (weighted average):

Rock fragments: 35 to 55 percent

Clay content: 18 to 27 percent

Reaction: slightly acid to neutral

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 2.5 or 3 moist

Chroma: 1 to 3, dry or moist

Rock fragments: tuff rock fragments; 35 to 65 percent gravel-sized rock fragments

C horizons:

Hue: 5YR or 7.5YR

Value: 3 to 5 dry, 2.5 to 4 moist

Chroma: 1 to 4, dry or moist

Texture modifier: gravelly or very gravelly

Rock fragments: tuff rock fragments; 25 to 55 percent gravel-sized rock fragments

Texture: loam, clay loam, or sandy loam

Foxtrot Series

The soils in the Foxtrot series are classified as fine-loamy, mixed, superactive thermic Argic Petrocalcids. These moderately deep, well drained soils formed in eolian sands over alluvium. Permeability is moderately slow above and below the very slowly permeable petrocalcic horizon. The soils are on basin floors. Slope is 0 to 5 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Foxtrot sand in an area of Foxtrot-Copia 0 to 5 percent slopes; in Otero County, New Mexico; approximately 13.7 miles west and 14.9 miles south of Orogrande; 1,800 feet east and 2,500 feet south of the northwest corner of sec. 3, T. 25 S., R. 6 E. USGS Newman NE topographic quadrangle; latitude 32 degrees 9 minutes 41.00 seconds north and

longitude 106 degrees 19 minutes 12.00 seconds west.
UTM zone 13, 375543E, 3558880N; NAD 27.

A—0 to 1 inch; strong brown (7.5YR 5/6) crushed, sand, brown (7.5YR 5/4) crushed, moist; 3 percent clay; single grain; nonsticky, and nonplastic, noneffervescent, by HCl, 3 normal; moderately alkaline, pH 8.0, pH meter 1:1 water; abrupt smooth boundary.

2Btk1—1 to 6 inches; strong brown (7.5YR 5/6) crushed, sandy clay loam, brown (7.5YR 5/4) crushed, moist; 20 percent clay; weak medium subangular blocky structure; slightly sticky and slightly plastic, common fine roots throughout and common coarse roots throughout and common very fine roots throughout; few distinct clay film on faces of peds; 5 percent medium spherical carbonate masses throughout; 5 percent nonflat 0.1- to 0.6-inch monzonite rock fragments; violent effervescence, by HCl, 3 normal; slightly alkaline, pH 7.7, pH meter 1:1 water; 10 percent calcium carbonate equivalent; clear smooth boundary.

2Btk2—6 to 29 inches; light brown (7.5YR 6/4) crushed, sandy clay loam, light brown (7.5YR 6/4) crushed, moist; 20 percent clay; weak medium subangular blocky structure; slightly sticky and slightly plastic, few fine and few medium roots; few distinct clay films on faces of peds; 25 percent coarse spherical weakly cemented carbonate masses throughout; violent effervescence, by HCl, 3 normal; slightly alkaline, pH 7.6, pH meter 1:1 water; 17 percent calcium carbonate equivalent; clear smooth boundary.

2Bkm—29 to 53 inches; pink (7.5YR 7/3) crushed, sandy clay loam, light brown (7.5YR 6/4) crushed, moist; 20 percent clay; weak thick platy structure; slightly sticky and slightly plastic, the top of the pan contains a thin root mat; the matrix is weakly to strongly cemented and fractured; 85 percent coarse spherical strongly cemented carbonate nodules that are weakly to strongly cemented throughout; violent effervescence, by HCl, 3 normal; moderately alkaline, pH 8.0, pH meter 1:1 water; 34 percent calcium carbonate equivalent; clear smooth boundary.

3Bk—53 to 80 inches; pink (7.5YR 7/3) crushed, sandy clay loam, light brown (7.5YR 6/4) crushed, moist; massive; slightly sticky and slightly plastic, 5 percent coarse spherical extremely weakly cemented carbonate masses throughout; violent effervescence, by HCl, 3 normal; moderately alkaline, pH 8.0, pH

meter 1:1 water; 13 percent calcium carbonate equivalent;

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to calcic horizon: 4 to 13 inches

Depth to petrocalcic horizon: 20 to 40 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 0 to 10 percent

Calcium carbonate equivalent: 15 to 40 percent (less than 2 mm fraction)

A horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 to 6, dry or moist

Rock fragments: mixed igneous rock fragments; 0 to 10 percent gravel-sized rock fragments

Btk horizon:

Value: 5 to 8 dry, 4 to 6 moist

Chroma: 2 to 6, dry or moist

Rock fragments: mixed igneous rock fragments; 0 to 10 percent gravel-sized rock fragments

2Bkm horizon:

Value: 7 or 8 dry, 5 or 6 moist

Chroma: 2 to 4 dry or moist

Rock fragments: 60 to 85 percent carbonates nodules.
Other features: The matrix is weakly to strongly cemented in places.

3Bk horizon:

Value: 7 to 8 dry, 5 or 6 moist

Chroma: 2 to 4, dry or moist

Rock fragments: mixed igneous rock fragments; 0 to 15 percent gravel-sized rock fragments

Other features: Contains 5 to 15 percent nodules or weakly cemented carbonates masses.

Globe Series

The soils in the Globe series are classified as fine, smectitic, thermic Chromic Haplotorrerts. These very deep, poorly drained, slowly permeable soils formed in clayey pluvial lake sediments. The soils are on depressional lake plains on basin floors. Slope is 0 to 1 percent. Elevation is 3,900 to 4,200 feet. Mean annual

precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Globe clay in an area of Globe clay, 0 to 1 percent slopes; in Dona Ana County, New Mexico; approximately 5 miles east and 10.6 miles south of White Sands; 2,200 feet north and 2,000 feet east of the southwest corner of sec. 12, T. 24 S., R. 5 E. USGS Newman NW topographic quadrangle; latitude 32 degrees 14 minutes 0.46 seconds north and longitude 106 degrees 23 minutes 14.25 seconds west. UTM zone 13S, 369287E, 3566969N; NAD 27.

A—0 to 2 inches; reddish brown (5YR 4/3) crushed, clay, reddish brown (5YR 5/3) crushed, dry; strong very fine granular structure; few fine roots throughout; cracks up to 10 inches wide; violent effervescence, by HCl, 3 normal; clear smooth boundary.

Bw—2 to 8 inches; reddish brown (5YR 4/3) crushed, clay, reddish brown (5YR 5/3) crushed, dry; strong coarse prismatic and strong coarse subangular blocky structure; few fine roots throughout; cracks up to 6 inches wide; violent effervescence, by HCl, 3 normal; clear smooth boundary.

Bss1—8 to 16 inches; reddish brown (5YR 4/3) exterior, clay, reddish brown (5YR 5/3) exterior, dry; 40 percent reddish gray (5YR 5/2) and 40 percent dark reddish gray (5YR 4/2) mottles; strong medium wedge structure; few fine roots throughout; cracks up to 3 inches wide; slickensides and pressure faces; striated uncoated sand grains; violent effervescence, by HCl, 3 normal; gradual smooth boundary.

Bss2—16 to 50 inches; brown (7.5YR 5/3) exterior, clay, brown (7.5YR 5/2) exterior, dry; 20 percent strong brown (7.5YR 4/6) and 20 percent brown (7.5YR 5/3) and 30 percent greenish gray (5GY 5/1) and 30 percent greenish gray (5GY 6/1) mottles; strong medium wedge structure; few fine roots throughout; cracks up to 3 inches wide; slickensides and pressure faces; violent effervescence, by HCl, 3 normal; gradual smooth boundary.

C—50 to 80 inches; brown (7.5YR 5/3) exterior, clay, brown (7.5YR 5/2) exterior, dry; 20 percent strong brown (7.5YR 4/6) and 20 percent brown (7.5YR 5/3) and 30 percent greenish gray (5GY 6/1) and 30 percent greenish gray (5GY 5/1) mottles; massive; cracks up to 1 inch wide; violent effervescence, by HCl, 3 normal.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The

moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to slickensides: 5 to 12 inches

Particle-size control section (weighted average):

Clay content: 35 to 60 percent

A horizon:

Hue: 5YR or 7.5YR

Value: 4 to 6 dry, 3 or 4 moist

Chroma: 2 or 3 dry, 3 or 4 moist

Bw horizon:

Hue: 5YR or 7.5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Bss horizon:

Hue: 5YR or 7.5YR, and 5GR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 2 or 3, dry or moist

Other features: chroma mottles: 1 to 6 dry

C horizon:

Hue: 5YR or 7.5YR, and 5GR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 2 or 3, dry or moist

Other features: chroma mottles: 1 to 6 dry

Hueco Series

The soils in the Hueco series are classified as coarse-loamy, mixed, superactive thermic Argic Petrocalcids. These moderately deep, well drained soils formed in sandy and loamy sediments. Permeability is moderately rapid above the very slowly permeable petrocalcic horizon and moderately slow below the petrocalcic horizon. The soils are on basins. Slope is 1 to 3 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Hueco loamy fine sand; in El Paso County, Texas; in pasture, 18 feet south of fence; 47 feet west of right-of-way marker; 109 feet south of yield sign on south side of junction of U. S. 180 and 62 and Farm Road 659 east of El Paso.

A—0 to 5 inches; brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; single grained; loose; nonsticky and nonplastic; few roots; noneffervescent, by HCl, 1 normal; slightly alkaline; clear boundary.

Bt1—5 to 18 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; massive; slightly hard, very friable; nonsticky and nonplastic; few roots; clay bridges between sand grains, few clay films in pores; noneffervescent, by HCl, 1 normal; slightly alkaline; clear wavy boundary.

Bt2—18 to 30 inches; yellowish brown (10YR 5/6) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak granular structure; soft and friable; nonsticky and nonplastic; few roots and fine pores; few threads and films of calcium carbonate; few clay films in pores; slight effervescence, by HCl, 1 normal; moderately alkaline; abrupt wavy boundary.

Bkm—30 to 34 inches; pinkish white (7.5YR 8/2) indurated caliche that is fractured, becoming less cemented with depth.

C—34 to 80 inches; pinkish gray (7.5YR 7/2) loam, pinkish gray (7.5YR 6/2) moist; massive; soft, very friable; 15 to 20 percent visible carbonates in the form of fragments and soft lumps; slight effervescence, by HCl, 1 normal; moderately alkaline.

Range in Characteristics

Soil moisture: Typic aridic moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to argillic horizon: 3 to 10 inches

Depth to secondary carbonates: 10 to 20 inches

Depth to petrocalcic horizon: 20 to 40 inches

Particle-size control section (weighted average):

Clay content: 8 to 18 percent

A horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 to 6 dry, 4 or 5 moist

Bt horizon:

Hue: 5YR, 7.5YR, or 10YR

Value: 5 to 7 dry, 4 or 5 moist

Chroma: 4 to 6, dry or moist

Infantry Series

The soils in the Infantry series are classified as loamy-skeletal, carbonatic, thermic, shallow Calcic Petrocalcids. These very shallow and shallow, well drained soils formed in stratified alluvium from limestone modified by eolian sands. Permeability is

moderately rapid above and below a very slowly permeable petrocalcic horizon. The soils are on erosion remnants on fan piedmonts. Slope is 3 to 10 percent. Elevation is 4,200 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Infantry very gravelly sandy loam is located in an area of Infantry-Sonic complex, 3 to 10 percent slopes; in Otero County, New Mexico; approximately 11.2 miles east and 0.3 mile north of Orogrande; 1,600 feet south and 590 feet west of the northeast corner of sec. 22, R. 10 E., T. 22 S. USGS Wilde Tank topographic quadrangle; latitude 32 degrees 22 minutes 49.00 seconds north and longitude 105 degrees 53 minutes 57.50 seconds west. UTM Zone: 13, 415415E, 3582780N; NAD27

A—0 to 2 inches; light brown (7.5YR 6/3) crushed, very gravelly sandy loam, brown (7.5YR 4/4) crushed, moist; 12 percent clay; weak medium subangular blocky parts to weak fine granular structure; very friable, slightly hard, slightly sticky, slightly plastic; 50 percent subangular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; moderately alkaline, pH 8.1, pH meter 1:1 water; clear smooth boundary.

Bk—2 to 10 inches; light brown (7.5YR 6/3) crushed, extremely cobbly sandy loam, brown (7.5YR 5/4) crushed, moist; 16 percent clay; weak medium subangular blocky and weak fine subangular blocky structure; very friable, slightly hard, slightly sticky, slightly plastic; 100 percent continuous prominent carbonate coats on rock fragments; 35 percent subangular 0.1- to 3-inch limestone rock fragments and 40 percent subangular 3- to 10-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; moderately alkaline, pH 8.4, pH meter 1:1 water; abrupt wavy boundary.

Bkm—10 to 14 inches; white (7.5YR 8/1) crushed; structure; indurated; violent effervescence, by HCl, 1 normal; upper 1/8 inch is laminated; abrupt smooth boundary.

2BCK1—14 to 22 inches; pink (7.5YR 7/3) crushed, extremely gravelly loamy coarse sand, light brown (7.5YR 6/4) crushed, moist; 4 percent clay; single grain; 80 percent continuous prominent carbonate coats on rock fragments; 15 percent subangular 3- to 10-inch limestone rock fragments and 60 percent subangular 0.1- to 3-inch limestone rock fragments;

violent effervescence, by HCl, 1 normal; moderately alkaline, pH 8.2, pH meter 1:1 water; abrupt smooth boundary.

3BCK2—22 to 34 inches; pink (7.5YR 7/3) crushed, extremely gravelly sandy clay loam, reddish yellow (7.5YR 6/6) crushed, moist; 22 percent clay; moderate coarse subangular blocky structure; friable, hard, slightly sticky, slightly plastic; 60 percent continuous prominent carbonate coats on rock fragments; 70 percent subangular 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; moderately alkaline, pH 8.2, pH meter 1:1 water; abrupt smooth boundary.

4BCK3—34 to 52 inches; light brown (7.5YR 6/4) crushed, extremely cobbly loamy sand, strong brown (7.5YR 5/6) crushed, moist; 8 percent clay; single grain; 10 percent discontinuous prominent carbonate coats on rock fragments; 35 percent subangular 0.1- to 3-inch limestone rock fragments and 40 percent subangular 3- to 10-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; moderately alkaline, pH 8.2, pH meter 1:1 water; abrupt smooth boundary.

5BCK4—52 to 80 inches; light brown (7.5YR 6/3) crushed, loamy sand, strong brown (7.5YR 5/6) crushed, moist; 13 percent clay; weak medium subangular blocky and weak fine subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; violent effervescence, by HCl, 1 normal; moderately alkaline, pH 8.2, pH meter 1:1 water.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Depth to calcic horizon: 1 to 4 inches

Depth to petrocalcic horizon: 7 to 20 inches

Particle-size control section (weighted average):

Clay content: 12 to 20 percent

Rock fragments: greater than 60 percent

Calcium carbonate equivalent: 40 to 60 percent (less than 20 mm fraction)

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Rock fragments: limestone rock fragments; 35 to 75 percent total rock fragments; 35 to 75 percent gravel, 0 to 10 percent cobbles

Bk horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Texture: fine sandy loam, sandy loam, or loam

Rock fragments: limestone rock fragments; 60 to 85 percent total rock fragments; 25 to 40 percent gravel; 35 to 60 percent cobbles

2BCK1 horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Texture: loamy coarse sand or coarse sandy loam

Rock fragments: limestone rock fragments; 60 to 85 percent total rock fragments; 60 to 70 percent gravel; 0 to 25 percent cobbles

3BCK2 horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 to 6, dry or moist

Texture: sandy clay loam or sandy loam

Rock fragments: limestone rock fragments; 60 to 85 percent total rock fragments; 50 to 85 percent gravel; 0 to 15 percent cobbles

4BCK3 horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 to 6, dry or moist

Texture: loamy fine sand or loamy sand

Rock fragments: limestone rock fragments; 60 to 85 percent total rock fragments; 25 to 40 percent gravel; 35 to 60 percent cobbles

5BCK4 horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 to 6, dry or moist

Texture: loamy fine sand or loamy sand

Rock fragments: limestone rock fragments; 0 to 15 percent total rock fragments; 0 to 15 percent gravel

Jerag Series

The soils in the Jerag series are classified as loamy, mixed, superactive thermic, shallow Ustalfic Petrocalcids. These shallow, well drained soils formed in alluvium modified by eolian sands. Permeability is moderately slow above and below the very slowly permeable petrocalcic horizon. The soils are on fan piedmonts. Slope is 1 to 5 percent. Elevation is 4,700 to 6,000 feet. Mean annual precipitation is about 13

inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Jerag very fine sandy loam; in Otero County, New Mexico; 360 feet west and 210 feet north of the southeast corner of the SW1/4 NW1/4 sec. 14, T. 26 S., R. 11 E. USGS Bassett Lake topographic quadrangle.

A—0 to 3 inches; brown (10YR 4/3) very fine sandy loam, dark brown (10YR 3/3) moist; weak fine and very fine subangular blocky structure parting to moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine tubular pores; slightly alkaline; abrupt smooth boundary.

Bt—3 to 9 inches; brown (7.5YR 4/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots; common very fine tubular pores; few thin clay films on faces of peds and in pores; slightly alkaline; abrupt smooth boundary.

Bk—9 to 19 inches; yellowish brown (10YR 5/4) gravelly loam, brown (10YR 4/3) moist; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; 20 percent gravel and 5 percent cobbles of cemented calcium carbonate; exteriors of rock fragments are very pale brown (10YR 7/4) and the interiors are very pale brown (10YR 8/2); slight effervescence, by HCl, 1 normal; moderately alkaline; abrupt wavy boundary.

Bkm—19 to 25 inches; white (10YR 8/1) indurated cemented pan, very pale brown (10YR 8/2) moist; massive; very strongly cemented; strong effervescence, by HCl, 1 normal; moderately alkaline; abrupt wavy boundary.

2Bk—25 to 80 inches; very pale brown (10YR 8/2) gravelly silt loam, pale brown (10YR 6/3) moist; massive; hard, firm, slightly plastic; 30 percent very hard and extremely hard strongly cemented angular calcium carbonate rock fragments; strong effervescence, by HCl, 1 normal; moderately alkaline.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The soil moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Depth to petrocalcic horizon: 14 to 20 inches

Particle-size control section (weighted average):
Percent clay: 18 to 35 percent

A horizon:

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Bt horizon:

Hue: 7.5YR or 10YR,

Value: 4 or 5, dry or moist

Chroma: 3 or 4

Texture: loam, clay loam, or sandy clay loam

Bk horizon:

Value: 5 to 7 dry, 4 or 5 moist

Chroma: 3 or 4.

Texture: gravelly loam or gravelly silt loam

Gravel content of the Bk horizon ranges from 20 to 35 percent.

Bkm horizon is continuously indurated except for scattered cracks and pockets. The laminar cap may or may not be present.

Malargo Series

The soils in the Malargo series are classified as fine-loamy, gypsic, thermic, Ustic Haplogypsis. These very deep, well drained, moderately permeable soils formed in alluvium. The soils are on fan piedmonts. Slope is 1 to 3 percent. Elevation is 4,000 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Malargo silt loam in an area of Malargo silt loam, 1 to 3 percent slopes; in Otero County, New Mexico; approximately 21.8 miles north and 6.8 miles east of Orogrande; 50 feet south and 50 feet west of the northeast corner of sec. 2, T. 19 S., R. 9 E. USGS Deadman Canyon topographic quadrangle; latitude 32 degrees 41 minutes 42 seconds north and longitude 105 degrees 58 minutes 47 seconds west. UTM zone 13, 408162E, 3617908N; NAD 27.

A—0 to 2 inches; light brown (7.5YR 6/3) crushed, silt loam, brown (7.5YR 4/3) crushed, moist; 24 percent clay; weak fine subangular blocky and weak medium platy structure; friable, slightly hard, slightly sticky, slightly plastic; few fine roots throughout; strong effervescence, by HCl, 1 normal; moderately alkaline, pH 8.3, pH meter 1:1 water; clear wavy boundary.

Bw—2 to 22 inches; brown (7.5YR 5/3) crushed, silt loam, brown (7.5YR 4/3) crushed, moist; 23 percent clay; moderate medium subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; few

fine roots throughout; few fine dendritic tubular pores; strong effervescence, by HCl, 1 normal; moderately alkaline, pH 8.2, pH meter 1:1 water; abrupt wavy boundary.

By1—22 to 42 inches; pinkish white (7.5YR 8/2) crushed, loam, pinkish gray (7.5YR 7/2) crushed, moist; 20 percent clay; moderate medium subangular blocky structure; very friable, soft, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 40 percent medium irregular gypsum masses throughout; strong effervescence, by HCl, 1 normal; moderately alkaline, pH 7.9, pH meter 1:1 water; diffuse wavy boundary.

By2—42 to 80 inches; pink (7.5YR 7/3) crushed, loam, light brown (7.5YR 6/4) crushed, moist; 23 percent clay; moderate medium subangular blocky structure; very friable, soft, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 50 percent medium irregular gypsum masses throughout; strong effervescence, by HCl, 1 normal; moderately alkaline, pH 7.9, pH meter 1:1 water.

Range in Characteristics

Soil moisture: Aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Soil temperature: 61 to 65 degrees F.

Depth to gypsic horizon: 12 to 30 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: less than 15 percent gravel

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

By horizon:

Hue: 7.5YR or 10YR

Value: 4 to 8, dry or moist

Chroma: 2 to 6, dry or moist

Mariola Series

The soils in the Mariola series are classified as fine-loamy, mixed, superactive, thermic Ustalfic Petrocalcids. These moderately deep, well drained, soils formed in alluvium influenced by eolian sand. Permeability is moderately slow above the very slowly permeable petrocalcic horizon and moderate below.

The soils are on erosional fan remnants of the fan piedmont. Slope is 1 to 3 percent. Elevation is 4,200 to 5,300 feet. The mean annual precipitation is about 11 inches, and the mean annual air temperature is about 62 degrees F. The frost-free days range from 170 to 210.

Typical Pedon

Typical pedon of Mariola fine sandy loam in an area of Mariola fine sandy loam, 1 to 3 percent slopes; in Otero County, New Mexico; approximately 7.1 miles east and 1.9 miles south of Orogrande; NE1/4, NE1/4 section 36, T. 22 S., R. 9 E. USGS Mack Tanks topographic quadrangle; latitude 32 degrees 21 minutes 13 seconds north and longitude 105 degrees 58 minutes 13 seconds west. UTM zone 13, 408722E, 3579881 N; NAD 27

A—0 to 4 inches; brown (7.5YR 5/4) crushed, fine sandy loam, brown (7.5YR 4/4) moist; weak very fine granular structure; common very fine roots throughout; 15 percent clay; 5 percent subrounded limestone gravel; violent effervescence, by HCl, 1 normal; moderately alkaline; abrupt smooth boundary.

Bt—4 to 12 inches; brown (7.5YR 5/4) crushed, sandy clay loam, brown (7.5YR 4/4) crushed, moist; moderate medium prismatic structure parting to moderate fine subangular blocky; common very fine roots throughout; common very fine low continuity tubular pores; 23 percent clay; few distinct discontinuous clay films on faces of peds and in pores; 10 percent subrounded limestone gravel; violent effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

Btk—12 to 20 inches; brown (7.5YR 5/4) crushed, sandy clay loam; brown (7.5YR 4/4) crushed, moist; weak medium prismatic structure parting to moderate fine subangular blocky; few very fine roots throughout; few very fine low continuity tubular pores; 25 percent clay; few distinct discontinuous clay films on faces of peds and in pores; common fine rounded carbonate concretions throughout and common fine rounded carbonate nodules throughout; 10 percent subrounded limestone gravel; violent effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

Bk—20 to 28 inches; light brown (7.5YR 6/4) crushed, gravelly loam, brown (7.5YR 4/4) crushed, moist; weak fine subangular blocky structure; few very fine roots throughout; 22 percent clay; common medium rounded carbonate nodules throughout; 15 percent subrounded limestone gravel and 1 percent subrounded limestone cobbles; violent effervescence, by HCl, 1 normal; moderately alkaline; clear wavy boundary.

Bkm1—28 to 35 inches; white (10YR 8/1) very pale brown (10YR 7/4) moist; indurated caliche, many white (10YR 8/1) carbonate concretions; violent effervescence, by HCl, 1 normal; 60 percent subrounded limestone cobbles; violent effervescence, by HCl, 1 normal; clear smooth boundary.

Bkm2—35 to 56 inches; white (10YR 8/1) very pale brown (10YR 7/4) moist; many white (10YR 8/1) carbonate concretions; 80 percent subrounded limestone cobbles; violent effervescence, by HCl, 1 normal; abrupt smooth boundary.

2Bk—56 to 80 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; common very fine vesicular pores; 30 percent calcium carbonate equivalent; few distinct patchy carbonate coats on faces of peds; common fine irregular very pale brown (10YR 8/2) carbonate concretions between peds; violent effervescence, by HCl, 1 normal; moderately alkaline.

Range in Characteristics

Soil moisture: Aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Soil temperature: 61 to 65 degrees F.

Depth to petrocalcic horizon: 20 to 40 inches

A horizon

Hue: 5YR or 7.5YR

Value: 4 to 6 dry, 3 to 5 moist

Chroma: 2 to 4, dry or moist

Rock fragments: 5 to 20 percent

Bt horizon

Hue: 5YR or 7.5YR

Value: 4 to 6 dry, 4 or 5 moist

Chroma: 3 to 6, dry or moist

Texture: sandy loam, sandy clay loam, or loam (18 to 35 percent clay)

Rock fragments: 0 to 20 percent

Bk horizon

Hue: 5YR or 7.5YR

Value: 4 to 7 dry, 3 to 6 moist

Chroma: 3 to 6, dry or moist

Texture: sandy loam, sandy clay loam, or loam (18 to 35 percent clay)

Rock fragments: 0 to 20 percent

Bkm horizon

Hue: 5YR or 7.5YR

Value: 7 or 8 dry, 6 or 7 moist

Chroma: 1 to 4, dry or moist

Rock fragments: 50 to 80 percent

2Bk horizon

Hue: 7.5YR or 10YR

Value: 7 or 8 dry, 5 or 6 moist

Chroma: 1 to 4, dry or moist

Texture: loam or clay loam

Rock fragments: 0 to 20 percent

Mcnew Series

The soils in the Mcnew series are classified as fine-loamy, mixed, superactive, thermic Typic Calciargids. These very deep, well drained, moderately slowly permeable soils formed in eolian sands over alluvium. The soils are on alluvial flats on basin floors. Slope is 1 to 5 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Mcnew sandy loam in an area of Mcnew-Copia complex, 2 to 5 percent slopes; in Otero County, New Mexico; approximately 5.6 miles west and 11.8 miles south of Orogrande; 900 feet east and 1,600 feet south of the northwest corner of Section 24, T. 24 S., R. 7 E. UTM zone 13, 388161E, 3563724N; NAD 27; USGS Desert topographic quadrangle; latitude 32 degrees 12 minutes 22.43 seconds north and longitude 106 degrees 11 minutes 11.93 seconds west.

A—0 to 3 inches; brown (7.5YR 5/4) crushed, sandy loam, strong brown (7.5YR 5/6) crushed, moist; 12 percent clay; weak fine granular and weak fine platy structure; strong effervescence, by HCl, 3 normal; moderately alkaline, pH 8.0, pH meter 1:1 water; 2 percent calcium carbonate equivalent; abrupt smooth boundary.

Btk1—3 to 8 inches; brown (7.5YR 5/3) crushed, sandy clay loam, brown (7.5YR 4/4) crushed, moist; 24 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; few distinct clay films on all faces of peds; 10 percent fine threads carbonate masses throughout; strong effervescence, by HCl, 3 normal; moderately alkaline, pH 7.9, pH meter 1:1 water; 6 percent calcium carbonate equivalent; abrupt wavy boundary.

Btk2—8 to 15 inches; pink (7.5YR 8/4) crushed, sandy clay loam, light brown (7.5YR 6/4) crushed, moist; 24 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; few distinct clay films on all faces of peds; 5 percent fine spherical weakly cemented carbonate nodules throughout and 40 percent medium irregular carbonate

masses throughout; strong effervescence, by HCl, 3 normal; moderately alkaline, pH 8.0, pH meter 1:1 water; 24 percent calcium carbonate equivalent; gradual smooth boundary.

Btk3—15 to 22 inches; pink (7.5YR 8/3) crushed, sandy clay loam, pink (7.5YR 7/3) crushed, moist; 26 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; few distinct clay films on all faces of peds; 5 percent fine spherical weakly cemented carbonate nodules throughout and 60 percent coarse irregular carbonate masses throughout; violent effervescence, by HCl, 3 normal; moderately alkaline, pH 8.1, pH meter 1:1 water; 22 percent calcium carbonate equivalent; gradual smooth boundary.

Btk4—22 to 33 inches; pinkish white (7.5YR 8/2) crushed, sandy clay loam, pink (7.5YR 7/4) crushed, moist; 28 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; few distinct clay films on all faces of peds; 5 percent fine spherical weakly cemented carbonate nodules throughout and 80 percent coarse irregular carbonate masses throughout; violent effervescence, by HCl, 3 normal; moderately alkaline, pH 8.2, pH meter 1:1 water; 32 percent calcium carbonate equivalent; gradual smooth boundary.

Btk5—33 to 45 inches; pinkish white (7.5YR 8/2) crushed, sandy clay loam, pink (7.5YR 7/3) crushed, moist; 26 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; few distinct clay films on all faces of peds; 5 percent fine spherical weakly cemented carbonate nodules throughout and 60 percent medium irregular carbonate masses throughout; violent effervescence, by HCl, 3 normal; moderately alkaline, pH 8.0, pH meter 1:1 water; 10 percent calcium carbonate equivalent; clear wavy boundary.

C—45 to 80 inches; pink (7.5YR 7/3) crushed, sandy loam, brown (7.5YR 5/4) crushed, moist; 14 percent clay; massive structure; 30 percent fine irregular carbonate masses throughout; strong effervescence, by HCl, 3 normal; moderately alkaline, pH 8.1, pH meter 1:1 water; 6 percent calcium carbonate equivalent.

Range in Characteristics

Soil moisture: Typic aridic moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to argillic horizon: 0 to 5 inches

Depth to calcic horizon: 10 to 20 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 0 to 5 percent

Calcium carbonate equivalent: 15 to 40 percent (less than 2 mm fraction)

A horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 to 6 moist

Chroma: 4 to 6, dry or moist

Rock fragments: mixed igneous rock fragments; 0 to 5 percent gravel size rock fragments

Btk horizon:

Value: 5 to 8 dry, 4 to 7 moist

Chroma: 2 to 6, dry or moist

Rock fragments: mixed igneous rock fragments; 0 to 5 percent gravel size rock fragments

C horizon:

Value: 6 to 8 dry, 5 or 6 moist

Chroma: 2 to 4, dry or moist

Rock fragments: mixed igneous rock fragments; 0 to 5 percent gravel size rock fragments

Missile Series

The soils in the Missile series are classified as loamy-skeletal, mixed, superactive, thermic, shallow Ustic Petrocalcids. These shallow and very shallow, well drained soils formed in alluvium derived from mixed igneous material. Permeability is moderately slow above and below the very slowly permeable petrocalcic horizon. The soils are on fan piedmonts. Slope is 3 to 15 percent. Elevation is 4,000 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual air temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Missile very gravelly fine sandy loam in an area of Missile very gravelly fine sandy loam, 3 to 15 percent slopes; in Dona Ana County, New Mexico; approximately 3.3 miles west and 14.7 miles south of White Sands, 90 feet east and 1,240 feet north of the southwest corner of sec. 3, T. 25 S., R. 4 E. USGS Bishop Cap topographic quadrangle; latitude 32 degrees, 09 minutes, 49.9 seconds north and longitude 106 degrees 31 minutes, 80.9 seconds west. UTM zone 13 355707E, 3558822N; NAD 27.

A—0 to 2 inches; brown (7.5YR 5/4) crushed, very gravelly fine sandy loam, dark brown (7.5YR 4/4) crushed, moist; 12 percent clay; weak medium platy

over weak fine granular structure; soft, very friable; nonsticky and nonplastic; few fine roots throughout; 25 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel, 15 percent nonflat subrounded 3- to 10-inch mixed igneous cobbles; violent effervescence by HCl, 1 normal; moderately alkaline, pH 8.1, pH meter 1:1 water; 4 percent calcium carbonate equivalent; gradual smooth boundary.

Bk—2 to 8 inches; brown (7.5YR 5/4) crushed, extremely gravelly sandy loam, dark brown (7.5YR 4/4) crushed, moist; 18 percent clay; weak fine subangular blocky and weak fine granular structure; soft, very friable; slightly sticky and slightly plastic; few fine roots throughout; few fine dendritic tubular pores, 5 percent fine thread carbonate masses on faces of peds; 60 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel and 10 percent nonflat subrounded 3- to 10-inch mixed igneous cobbles; violent effervescence by HCl, 1 normal; moderately alkaline, pH 8.0, pH meter 1:1 water; 10 percent calcium carbonate equivalent; abrupt smooth boundary.

Bkm—8 to 12 inches; pink (7.5YR 7/4), carbonate-cemented material, light brown (7.5YR 6/4) moist; massive; very hard; carbonate laminae occur discontinuously in upper part; violent effervescence; moderately alkaline; gradual smooth boundary.

2Bk1—12 to 20 inches; pink (7.5YR 7/4) crushed, gravelly loam, light brown (7.5YR 6/4) crushed, moist; 24 percent clay; moderate medium subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; very few fine roots throughout; very few fine dendritic tubular pores; 90 percent coarse irregular carbonate masses in matrix; 15 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel and 5 percent nonflat subrounded 3- to 10-inch mixed igneous cobbles; violent effervescence by HCl, 1 normal; slightly alkaline, pH 7.8, pH meter 1:1 water; 40 percent calcium carbonate equivalent; gradual wavy boundary.

2Bk2—20 to 26 inches; pink (7.5YR 7/3) crushed, loam, light brown (7.5YR 6/4) crushed, moist; 24 percent clay; moderate medium and fine subangular blocky structure; hard, very firm; slightly sticky and slightly plastic; very few fine roots throughout; very few fine dendritic tubular pores; 75 percent coarse irregular carbonate masses on faces of peds; 10 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel; violent effervescence by HCl, 1 normal; moderately alkaline, pH 8.1, pH meter 1:1 water; 40 percent calcium carbonate equivalent; gradual wavy boundary.

2Bk3—26 to 44 inches; light brown (7.5YR 6/4)

crushed, cobbly loam, brown (7.5YR 5/4) crushed, moist; 24 percent clay; moderate medium and fine subangular blocky structure; very hard, extremely firm; moderately sticky and moderately plastic; 40 percent medium irregular carbonate masses on faces of peds; 10 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel and 20 percent nonflat subrounded 3- to 10-inch mixed igneous cobbles; violent effervescence by HCl, 1 normal; moderately alkaline, pH 8.3, pH meter 1:1 water; 24 percent calcium carbonate equivalent; gradual smooth boundary.

2Bk4—44 to 80 inches; light brown (7.5YR 6/4) crushed, gravelly loam, brown (7.5YR 5/4) crushed, moist; 24 percent clay; moderate medium subangular blocky structure; very hard, extremely firm; very sticky and very plastic; 20 percent medium irregular carbonate masses on faces of peds; 20 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel and 10 percent nonflat subrounded 3- to 10-inch mixed igneous cobbles; violent effervescence by HCl, 1 normal; strongly alkaline, pH 8.8, pH meter 1:1 water; 24 percent calcium carbonate equivalent.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The soil moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Depth to petrocalcic horizon: 8 to 20 inches

Particle-size control section (weighted average):

Clay content: 8 to 18 percent

Rock fragments: greater than 60 percent

Reaction: slightly alkaline to moderately alkaline

Calcium carbonate equivalent: 2 to 15 percent

A horizon:

Hue: 5YR to 10YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 4 to 6, dry or moist

Rock fragments: mixed igneous rock fragments; 30 to 40 total rock fragments; 5 to 25 percent gravel, 15 to 20 percent cobbles.

Bk horizon:

Hue: 5YR to 10YR

Value: 4 or 5 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Texture modifier: very gravelly or extremely gravelly

Rock fragments: 60 to 85 percent mixed igneous rock fragments; 45 to 70 percent gravel; 5 to 15 percent cobbles.

Texture: loam or sandy loam

2Bk horizons:

Hue: 5YR to 10YR
 Value: 6 to 8 dry, 5 to 7 moist
 Chroma: 3 or 6, dry or moist
 Texture modifier: gravelly or cobbly
 Rock fragments: 10 to 35 percent mixed igneous rock fragments; 5 to 25 percent gravel; 0 to 20 percent cobbles.

Modeama Series

The soils in the Modeama series are classified as clayey-skeletal, mixed, superactive, mesic Typic Argiustolls. These moderately deep, well drained, moderately slowly permeable soils formed in colluvium from limestone. The soils are on mountains. Slope is 5 to 35 percent. Elevation is 6,500 to 7,650 feet. Mean annual precipitation is about 17 inches, and the mean annual temperature is about 52 degrees F. The frost-free period is 120 to 160 days.

Typical Pedon

Typical pedon of Modeama extremely cobbly silt loam in an area of Modeama-Rock outcrop complex, 5 to 15 percent slopes; in Otero County, New Mexico; approximately 2.5 miles south and 1.25 miles west of Timberon; 200 feet west and 200 feet south of the northeast corner of sec. 4, T. 20 S., R. 12 E. USGS El Paso Canyon topographic quadrangle; latitude 32 degrees 36 minutes 6.35 seconds north and longitude 105 degrees 42 minutes 47.89 seconds west. UTM Zone 13, 433067E, 3607174N; NAD 27.

A—0 to 4 inches; dark reddish gray (5YR 4/2) crushed, extremely cobbly silt loam, dark reddish brown (5YR 2/2) crushed, moist; 25 percent clay; weak fine subangular blocky and moderate very fine granular structure; 1 percent subangular 10- to 20-inch limestone rock fragments and 20 percent subangular 0.1- to 3-inch limestone rock fragments and 50 percent subangular 3- to 10-inch limestone rock fragments; noneffervescent, by HCl, 3 normal; clear smooth boundary.

Btk—4 to 14 inches; reddish brown (5YR 5/3) crushed, extremely cobbly silty clay, dark reddish brown (5YR 3/2) crushed, moist; 45 percent clay; strong fine subangular blocky structure; 85 percent continuous prominent clay films on faces of pedis; 3 percent fine spherical weakly cemented carbonate nodules; 1 percent subangular 10- to 20-inch limestone rock fragments and 25 percent subangular 0.1- to 3-inch limestone rock fragments and 45 percent subangular 3- to 10-inch limestone rock fragments; strong

effervescence, by HCl, 3 normal; clear smooth boundary.

Bk—14 to 33 inches; pink (5YR 8/3) crushed, extremely cobbly loam, light reddish brown (5YR 6/3) crushed, moist; 25 percent clay; massive; 10 percent subangular 10- to 20-inch limestone rock fragments and 20 percent subangular 0.1- to 3-inch limestone rock fragments and 20 percent subangular strongly cemented 0.1- to 10-inch calcrete rock fragments and 35 percent subangular 3- to 10-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; abrupt smooth boundary.

R—33 inches; limestone.

Range in Characteristics

Soil moisture: A typical ustic moisture regime. The moisture control section is usually dry in some or in all parts for six-tenths or less of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 51 to 55 degrees F.

Thickness of mollic epipedon: 10 to 20 inches

Depth to lithic contact: 20 to 40 inches

Depth to calcic horizon: 10 to 20 inches

Particle-size control section (weighted average):

Clay content: 40 to 50 percent

Rock fragments: 65 to 85 percent

Calcium carbonate equivalent: 5 to 15 percent (less than 20mm fraction)

A horizon:

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Rock fragments: limestone rock fragments; 65 to 85 percent total rock fragments; 10 to 25 percent gravel; 45 to 55 percent cobbles, 0 to 5 percent stones

Btk horizon:

Value: 4 to 6 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Rock fragments: limestone rock fragments; 65 to 85 percent total rock fragments; 15 to 30 percent gravel; 40 to 50 percent cobbles, 0 to 5 percent stones

Bk horizon:

Value: 6 to 8 dry, 5 to 7 moist

Chroma: 2 to 4, dry or moist

Rock fragments: calcrete and limestone rock fragments; 65 to 85 percent total rock fragments; 15 to 25 percent gravel; 30 to 40 percent cobbles, 0 to 15

percent stones, 15 to 25 percent calcrete rock fragments

Calcium carbonate equivalent: 40 to 60 percent (less than 20mm fraction)

Nations Series

The soils in the Nations series are classified as coarse-loamy, mixed, superactive thermic Typic Petrocalcids. These moderately deep, well drained soils formed in recent eolian material and sandy and loamy sediments. Permeability is moderately slow above the very slowly permeable petrocalcic horizon and moderately rapid below the petrocalcic horizon. The soils are on alluvial flats on basin floors. Slope is 1 to 3 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Nations loamy fine sand in an area of Copia-Nations complex, 1 to 3 percent slopes; in El Paso County, Texas; approximately 20 miles northeast of El Paso, 9.2 miles north of U.S. Highways 62 and 180; USGS Nations East Well topographic quadrangle; latitude 32 degrees 57 minutes 19 seconds north and longitude 106 degrees 11 minutes 4 seconds west. UTM zone 13, 388049E, 3535924N; NAD 27.

A—0 to 5 inches; reddish brown (5YR 5/4) crushed, loamy fine sand, reddish brown (5YR 4/4) crushed, moist; single grain; common very fine roots throughout; noneffervescent, by HCl, 1 normal; abrupt smooth boundary.

2Bw1—5 to 16 inches; strong brown (7.5YR 5/6) crushed, fine sandy loam, strong brown (7.5YR 4/6) crushed, moist; massive; common very fine roots throughout; common medium rounded carbonate nodules throughout; strong effervescence, by HCl, 1 normal; clear smooth boundary.

2Bw2—16 to 25 inches; light brown (7.5YR 6/4) crushed, fine sandy loam, brown (7.5YR 5/4) crushed, moist; massive; common medium roots throughout; common medium rounded carbonate nodules throughout; strong effervescence, by HCl, 1 normal; abrupt smooth boundary.

3Bkm—25 to 36 inches; white (7.5YR 8/1) broken face, white (7.5YR 8/1) broken face, moist; indurated by carbonates; violent effervescence, by HCl, 1 normal; gradual wavy boundary.

3Bk—36 to 63 inches; white (7.5YR 8/1) broken face, loamy sand, pink (7.5YR 8/3) broken face, moist;

massive; violent effervescence, by HCl, 1 normal; clear smooth boundary.

4Btkb—63 to 75 inches; reddish yellow (5YR 6/6) crushed, loamy sand, yellowish red (5YR 4/6) crushed, moist; strong coarse prismatic structure; rigid; few distinct patchy clay films on faces of peds and few prominent continuous carbonate coats in root channels and/or pores; common fine platelike iron-manganese concretions throughout; slight effervescence, by HCl, 1 normal; clear smooth boundary.

5C—75 to 80 inches; light reddish brown (5YR 6/4) crushed, loamy fine sand, reddish brown (5YR 5/4) crushed, moist; massive; strong effervescence, by HCl, 1 normal.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degree F.

Depth to Bw horizon: 4 to 8 inches

Depth to petrocalcic horizon: 20 to 40 inches

Particle-size control section (weighted average):

Depth to secondary carbonates: 4 to 20 inches

A horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 to 6, dry or moist

Other features: The surface layer consists of recent eolian sand

Bw horizons:

Hue: 5YR, 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 4 to 6, dry or moist

Other features: The Bw horizons is weakly to strongly consolidated with bulk density of 1.91

Bkm horizon:

Hue: 7.5YR or 10YR

Value: 7 or 8, dry or moist

Chroma: 1 to 3, dry or moist

C horizon:

Hue: 5YR, 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 4 to 6, dry or moist

Oryx Series

The soils in the Oryx series are classified as loamy-skeletal, carbonatic, thermic Ustic Torrifluvents. These

very deep, well drained, moderately slowly permeable soils formed in calcareous alluvium. The soils are on inset fans on fan piedmonts. Slope is 1 to 5 percent. Elevation is 4,700 to 6,000 feet. Mean annual precipitation is about 13 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Oryx loam in an area of Oryx-Reyab complex, 1 to 3 percent slopes; in Otero County, New Mexico; approximately 23.6 miles east and 4.3 miles north of Orogrande; SW1/4, SE1/4 sec. 26, T. 21 S., R. 12 E. USGS El Paso Draw topographic quadrangle; latitude 32 degrees 26 minutes 42 seconds north and longitude 105 degrees 41 minutes 17 seconds west. UTM zone 13, 435289E, 3589784N; NAD 27.

A—0 to 4 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; common fine to coarse roots in mat at top of horizon; fine low continuity vesicular pores; 11 percent calcium carbonate equivalent; strong effervescence, by HCl, 3 normal; moderately alkaline; abrupt smooth boundary.

2C1—4 to 37 inches; brown (7.5YR 5/4) extremely gravelly loam, dark brown (7.5YR 3/4) moist; weak very fine granular structure; common fine roots throughout; 14 percent calcium carbonate equivalent (less than 2 mm fraction); 70 percent subrounded limestone gravel; strong effervescence, HCl, 3 normal; moderately alkaline; abrupt smooth boundary.

3C2—37 to 55 inches; brown (7.5YR 5/3) silt loam, dark brown (7.5YR 3/4) moist; weak fine and medium angular blocky structure; common fine and medium roots throughout; common fine low continuity vesicular pores; 11 percent calcium carbonate equivalent; violent effervescence, by HCl, 3 normal; moderately alkaline; diffuse smooth boundary.

3C3—55 to 80 inches; brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3) moist; weak fine and medium angular blocky structure; common very fine roots throughout; common fine low continuity vesicular pores; 13 percent calcium carbonate equivalent; violent effervescence, by HCl, 3 normal; moderately alkaline.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Soil temperature: 59 to 62 degrees F.

Particle-size control section (weighted average):

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 40 to 60 percent (less than 20 mm fraction)

Rock fragments: 65 to 85 percent of pebble-sized limestone rock fragments in the 2C horizon

A horizon:

Hue: 7.5YR or 10YR

Value: 4 to 6 dry, 3 to 6 moist

Chroma: 4 or 5, dry or moist

2C horizon:

Hue: 7.5YR or 10YR

Value: 4 to 7 dry, 3 to 6 moist

Chroma: 4 or 5, dry or moist

Texture: extremely gravelly loam, extremely gravelly clay loam, or extremely gravelly sandy clay loam

3C horizon:

Hue: 7.5YR or 10YR

Value: 4 to 7 dry, 3 to 6 moist

Chroma: 3 to 5, dry or moist

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

Patriot Series

The soils in the Patriot series are classified as coarse-loamy, mixed, superactive, thermic Typic Calciargids. These very deep, well drained, moderately rapidly permeable soils formed in eolian sands over alluvium. The soils are on alluvial flats on basin floors. Slope is 2 to 5 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Patriot sand in an area of Copia-Patriot complex, 2 to 5 percent slopes; in Otero County, New Mexico; approximately 11.2 miles north and 5 miles east of Orogrande; 1,600 feet east and 1,000 feet north of the southwest corner of sec. 27, T. 29 S., R. 9 E. USGS Tres Hermanos SE topographic quadrangle; latitude 32 degrees 32 minutes 18.5 seconds north and longitude 106 degrees 0 minutes 21.1 seconds west. UTM zone 13, 405765E, 3600149N; NAD 27.

A—0 to 3 inches; light reddish brown (5YR 6/4) crushed, sand, yellowish red (5YR 4/6) crushed, moist; 4 percent clay; single grain and weak very thin platy structure; loose, nonsticky, nonplastic; very slight effervescence, by HCl, 1 normal; slightly alkaline, pH 7.6, pH meter 1:1 water; clear smooth boundary.

Bt—3 to 6 inches; yellowish red (5YR 5/6) crushed,

sandy loam, yellowish red (5YR 4/6) crushed, moist; 14 percent clay; weak coarse subangular blocky and weak medium subangular blocky structure; very friable, soft, slightly sticky, nonplastic; 5 percent distinct clay films on all faces of peds and 10 percent distinct clay bridging between sand grains; very slight effervescence, by HCl, 1 normal; slightly alkaline, pH 7.4, pH meter 1:1 water; gradual wavy boundary.

Btk1—6 to 9 inches; yellowish red (5YR 5/6) crushed, sandy loam, yellowish red (5YR 4/6) crushed, moist; 14 percent clay; weak medium prismatic and moderate coarse subangular blocky structure; very friable, soft, slightly sticky, nonplastic; 5 percent distinct clay films on all faces of peds and 10 percent distinct clay bridging between sand grains; 10 percent fine threadlike carbonate masses throughout; slight effervescence, by HCl, 1 normal; slightly alkaline, pH 7.6, pH meter 1:1 water; gradual wavy boundary.

Btk2—9 to 19 inches; reddish yellow (5YR 6/6) crushed, sandy loam, yellowish red (5YR 5/6) crushed, moist; 16 percent clay; moderate medium subangular blocky and moderate coarse subangular blocky structure; very friable, soft, slightly sticky, slightly plastic; 5 percent distinct clay films on all faces of peds and 10 percent distinct clay bridging between sand grains; 15 percent fine threadlike carbonate masses throughout; strong effervescence, by HCl, 1 normal; slightly alkaline, pH 7.4, pH meter 1:1 water; gradual wavy boundary.

Btk3—19 to 28 inches; reddish yellow (5YR 6/6) crushed, sandy loam, yellowish red (5YR 5/6) crushed, moist; 16 percent clay; moderate medium subangular blocky and moderate coarse subangular blocky structure; very friable, soft, slightly sticky, slightly plastic; 5 percent distinct clay bridging between sand grains and 10 percent distinct clay films on all faces of peds; 15 percent fine threadlike carbonate masses throughout; strong effervescence, by HCl, 1 normal; slightly alkaline, pH 7.4, pH meter 1:1 water; gradual wavy boundary.

Bk1—28 to 39 inches; light reddish brown (5YR 6/4) crushed, loamy sand, yellowish red (5YR 5/6) crushed, moist; 8 percent clay; weak coarse subangular blocky and weak medium subangular blocky structure; very friable, soft, nonsticky, nonplastic; 5 percent medium irregular carbonate masses throughout; strong effervescence, by HCl, 1 normal; slightly alkaline, pH 7.6, pH meter 1:1 water; gradual wavy boundary.

Bk2—39 to 51 inches; light reddish brown (5YR 6/4) crushed, loamy sand, yellowish red (5YR 5/8) crushed, moist; 6 percent clay; weak medium subangular blocky

and weak coarse subangular blocky structure; very friable, soft, nonsticky, nonplastic; 5 percent medium irregular carbonate masses throughout; strong effervescence, by HCl, 1 normal; slightly alkaline, pH 7.7, pH meter 1:1 water; gradual wavy boundary.

Bk3—51 to 80 inches; light reddish brown (5YR 6/4) crushed, loamy sand, yellowish red (5YR 5/6) crushed, moist; 6 percent clay; weak medium subangular blocky and weak coarse subangular blocky structure; very friable, soft, nonsticky, nonplastic; 5 percent medium irregular carbonate masses throughout; strong effervescence, by HCl, 1 normal; slightly alkaline, pH 7.8, pH meter 1:1 water.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to base of argillic horizon: 20 to 40 inches

Depth to calcic horizon: 2 to 10 inches

Particle-size control section (weighted average):

Clay content: 10 to 18 percent

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 to 6, dry or moist

Bt horizon:

Value: 4 to 6, dry or moist

Chroma: 5 or 6, dry or moist

Btk horizon:

Value: 4 to 6, dry or moist

Chroma: 5 or 6, dry or moist

Calcium carbonate equivalent: 5 to 10 percent

Bk horizon:

Value: 5 or 6 dry, 4 to 6 moist

Chroma: 4 or 5 dry, 6 to 8 moist

Rock fragments: mixed igneous rock fragments; 0 to 5 percent gravel-sized rock fragments

Calcium carbonate equivalent: 1 to 5 percent

Penagua Series

The soils in the Penagua series are classified as loamy-skeletal, carbonatic, mesic Typic Calciustolls. These very deep, well drained, moderately slowly permeable soils formed in colluvium from limestone. The soils are on mountains. Slope is 15 to 35 percent. Elevation is 6,500 to 7,650 feet. Mean annual precipitation is about 17 inches, and the mean annual

temperature is about 52 degrees F. The frost-free period is 120 to 160 days.

Typical Pedon

Typical pedon of Penagua very cobbly silt loam in an area of Penagua-Modeama-Rock outcrop complex, 15 to 35 percent slopes; in Otero County, New Mexico; approximately 3 miles south and 1 mile west of Timberon; 400 feet east and 20 feet north of the southwest corner of sec. 3, T. 20 S., R. 12 E. USGS El Paso Canyon topographic quadrangle; latitude 32 degrees 35 minutes 26.48 seconds north and longitude 105 degrees 42 minutes 37.57 seconds west. UTM Zone 13, 433328E, 3605945N; NAD 27

Ak1—0 to 6 inches; brown (7.5YR 4/2) very cobbly silt loam, very dark brown (7.5YR 2/2) crushed, moist; 20 percent clay; strong very fine granular structure; slightly hard, very friable; slightly sticky and slightly plastic; 20 percent discontinuous distinct carbonate coats on bottom surfaces of rock fragments; 5 percent fine spherical carbonate masses throughout; violent effervescence, by HCl, 1 normal; 25 percent subangular 3- to 10-inch limestone rock fragments and 30 percent subangular 0.1- to 3-inch limestone rock fragments; clear smooth boundary.

Ak2—6 to 11 inches; brown (7.5YR 4/2) very cobbly silt loam, dark brown (7.5YR 3/2) crushed, moist; 20 percent clay; strong very fine granular structure; slightly hard, very friable; slightly sticky and slightly plastic; 20 percent discontinuous distinct carbonate coats on rock fragments; 10 percent fine spherical carbonate masses throughout; violent effervescence, by HCl, 1 normal; 25 percent subangular 3- to 10-inch limestone rock fragments and 30 percent subangular 0.1- to 3-inch limestone rock fragments; gradual smooth boundary.

Bk1—11 to 26 inches; pinkish gray (7.5YR 7/2) very cobbly silt loam, light brown (7.5YR 6/3) crushed, moist; 22 percent clay; moderate very fine granular structure; slightly hard, very friable; slightly sticky and slightly plastic; 80 percent continuous prominent carbonate coats on rock fragments; 90 percent fine irregular carbonate masses throughout; violent effervescence, by HCl, 1 normal; 25 percent subangular 3- to 10-inch limestone rock fragments and 30 percent subangular 0.1- to 3-inch limestone rock fragments; clear smooth boundary.

Bk2—26 to 33 inches; pink (7.5YR 8/3) very cobbly silt loam, pink (7.5YR 7/4) crushed, moist; 24 percent clay; weak very fine subangular blocky structure;

slightly hard, very friable; slightly sticky and slightly plastic; 80 percent continuous prominent carbonate coats on rock fragments; 90 percent fine irregular carbonate masses throughout; violent effervescence, by HCl, 1 normal; 25 percent subangular 3- to 10-inch limestone rock fragments and 30 percent subangular 0.1- to 3-inch limestone rock fragments; clear smooth boundary.

Bk3—33 to 46 inches; pink (7.5YR 7/3) very cobbly silt loam, light brown (7.5YR 6/4) crushed, moist; 24 percent clay; weak very fine subangular blocky structure; slightly hard, very friable; slightly sticky and slightly plastic; 80 percent continuous prominent carbonate coats on rock fragments; 90 percent fine irregular carbonate masses throughout; violent effervescence, by HCl, 1 normal; 25 percent subangular 3- to 10-inch limestone rock fragments and 30 percent subangular 0.1- to 3-inch limestone rock fragments; clear smooth boundary.

Bk4—46 to 80 inches; pink (7.5YR 8/3) very gravelly silt loam, pink (7.5YR 7/3) crushed, moist; 24 percent clay; weak very fine subangular blocky structure; slightly hard, very friable; slightly sticky and slightly plastic; 80 percent continuous prominent carbonate coats on rock fragments; 90 percent fine irregular carbonate masses throughout; violent effervescence, by HCl, 1 normal; 15 percent subangular 3- to 10-inch limestone rock fragments and 40 percent subangular 0.1- to 3-inch limestone rock fragments.

Range in Characteristics

Soil moisture: A typic ustic moisture regime. The moisture control section is usually dry in some or in all parts for six-tenths or less of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Soil temperature: 51 to 55 degrees F.

Mollic epipedon: 10 to 20 inches thick

Depth to calcic horizon: 10 to 20 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 35 to 65 percent

Calcium carbonate equivalent: 40 to 80 percent (less than 20 mm fraction)

Ak horizon:

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Rock fragments: limestone rock fragments; 35 to 60 percent total rock fragments; 20 to 40 percent gravel; 15 to 30 percent cobbles

Bk horizon:

Hue: 7.5YR or 10YR

Value: 6 to 8 dry, 4 to 7 moist

Chroma: 2 to 4, dry or moist

Rock fragments: limestone rock fragments; 35 to 60 percent total rock fragments; 20 to 40 percent gravel; 15 to 30 percent cobbles

Penalto Series

The soils in the Penalto series are classified as loamy-skeletal, carbonatic, mesic, shallow Petrocalcic Calciustolls. These shallow, well drained soils formed in gravelly alluvium from limestone. Permeability is moderate above the very slowly permeable petrocalcic horizon. The soils are on hills. Slope is 5 to 65 percent. Elevation is 5,500 to 6,800 feet. Mean annual precipitation is about 15 inches, and the mean annual temperature is about 56 degrees F. The frost-free period is 130 to 170 days.

Typical Pedon

Typical pedon of Penalto very gravelly loam in an area of Deama-Penalto-Rock outcrop complex, 5 to 15 percent slopes; in Otero County, New Mexico; approximately 3.4 miles south and 1.8 miles west of Timberon; 2,200 feet east and 100 feet north of the southwest corner of sec. 4, T. 20 S., R. 12 E. USGS El Paso Canyon topographic quadrangle; latitude 32 degrees 35 minutes 27.22 seconds north and longitude 105 degrees 43 minutes 15.52 seconds west. UTM zone 13S, 3605973N, 432338E; NAD 27.

Ak1—0 to 6 inches; brown (7.5YR 4/3) crushed, very gravelly loam, dark brown (7.5YR 3/2) crushed, moist; 22 percent clay; moderate fine granular structure; very friable, soft, slightly sticky, slightly plastic; common very fine roots; discontinuous prominent carbonate coats on rock fragments; 5 percent subrounded 0.1- to 3-inch calcrete rock fragments and 15 percent subrounded 3- to 10-inch limestone rock fragments and 25 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; clear smooth boundary.

Ak2—6 to 16 inches; brown (7.5YR 5/3) crushed, very cobbly loam, dark brown (7.5YR 3/3) crushed, moist; 22 percent clay; moderate fine subangular blocky structure; very friable, slightly hard, slightly sticky, moderately plastic; common very fine roots; discontinuous prominent carbonate coats on rock

fragments; 10 percent subrounded 0.1- to 3-inch calcrete rock fragments and 20 percent subrounded 3- to 10-inch limestone rock fragments and 25 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; abrupt smooth boundary.

Bkm1—16 to 20 inches; pinkish gray (7.5YR 7/2) broken face, light brown (7.5YR 6/3) broken face, moist; massive, indurated; 10 percent subrounded 3- to 10-inch limestone rock fragments and 30 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; clear smooth boundary.

Bkm2—20 to 39 inches; pinkish gray (7.5YR 7/2) broken face, very gravelly loam, light brown (7.5YR 6/3) broken face, moist; 20 percent clay; massive, moderately cemented; discontinuous prominent carbonate coats on rock fragments; 10 percent subrounded 3- to 10-inch limestone rock fragments and 40 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 3 normal; clear smooth boundary.

Bkm3—39 to 80 inches; pink (7.5YR 7/3) broken face, very gravelly loam, light brown (7.5YR 6/3) broken face, moist; 20 percent clay; massive, moderately cemented; discontinuous prominent carbonate coats on rock fragments; 15 percent subrounded 3- to 10-inch limestone rock fragments and 40 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 3 normal.

Range in Characteristics

Soil moisture: An ustic soil moisture regime bordering on aridic. The moisture control section is usually dry in some or all parts six-tenths or more of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 55 to 59 degrees F.

Thickness of mollic epipedon: 10 to 20 inches

Depth to petrocalcic horizon: 10 to 20 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Calcium carbonate equivalent: 40 to 60 percent (less than 20mm fraction)

Rock fragments: 35 to 60 percent

Ak horizon:

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3, dry or moist

Rock fragments: limestone rock fragments; 35 to 60 percent total rock fragments; 20 to 30 percent gravel; 15 to 30 percent cobbles

Bkm horizon:

Hue: 7.5YR or 10YR

Value: 6 to 8 dry, 5 or 6 moist

Chroma: 2 or 3 dry, 2 to 4 moist

Rock fragments: limestone rock fragments; 35 to 60 percent total rock fragments; 25 to 45 percent gravel; 10 to 25 percent cobbles

Pendero Series

The soils in the Pendero series are classified as sandy, mixed, thermic Typic Haplargids. These very deep, excessively drained, moderately rapidly permeable soils formed in eolian sands. The soils are on sand sheets on basin floors. Slope is 2 to 5 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Pendero fine sand in an area of Pendero fine sand, 2 to 5 percent slopes; in Otero County, New Mexico; approximately 3.1 miles north and 3.7 miles east of Orogrande; 2,150 feet east and 1,950 feet south of the northwest corner of sec. 4, T. 22 S., R. 9 E. USGS Orogrande North topographic quadrangle; latitude 32 degrees 25 minutes 18.85 seconds north and longitude 106 degrees 01 minutes 37.59 seconds west. UTM zone 13, 403425E, 3587477N; NAD 27.

A—0 to 1 inch; reddish brown (5YR 5/3) crushed, fine sand, reddish brown (5YR 4/4) crushed, moist; 5 percent clay; weak medium platy structure; loose, nonsticky, nonplastic, noneffervescent, by HCl, 1 normal; abrupt smooth boundary.

Bw—1 to 5 inches; reddish brown (5YR 5/3) crushed, loamy fine sand, reddish brown (5YR 4/4) crushed, moist; 8 percent clay; weak medium platy structure; loose, nonsticky, nonplastic; common very fine roots throughout, noneffervescent, by HCl, 1 normal; abrupt smooth boundary.

Bt1—5 to 17 inches; reddish brown (5YR 5/3) crushed, loamy fine sand, reddish brown (5YR 4/4) crushed, moist; 12 percent clay; weak coarse subangular blocky structure; very friable, soft, nonsticky, nonplastic; common very fine roots throughout; common fine vesicular pores; 25 percent distinct clay films on all faces of peds and 35 percent distinct clay bridging between sand grains, noneffervescent, by HCl, 1 normal; clear wavy boundary.

Bt2—17 to 25 inches; reddish brown (5YR 5/3) crushed, loamy fine sand, reddish brown (5YR 4/4) crushed, moist; 12 percent clay; weak coarse subangular blocky structure; very friable, soft, nonsticky, nonplastic; few very fine roots throughout; common fine vesicular pores; 20 percent distinct clay films on all faces of peds and 30 percent distinct clay bridging between sand grains, noneffervescent, by HCl, 1 normal; abrupt irregular boundary.

Btk1—25 to 45 inches; reddish brown (5YR 5/4) crushed, loamy fine sand, yellowish red (5YR 4/6) crushed, moist; 8 percent clay; weak coarse subangular blocky structure; very friable, soft, nonsticky, nonplastic; few very fine roots throughout; few fine tubular pores; 25 percent distinct clay films on all faces of peds and 30 percent distinct clay bridging between sand grains; 1 percent fine threadlike carbonate masses throughout; slight effervescence, by HCl, 1 normal; clear wavy boundary.

Btk2—45 to 66 inches; reddish brown (5YR 5/4) crushed, loamy fine sand, yellowish red (5YR 4/6) crushed, moist; 8 percent clay; weak coarse subangular blocky structure; very friable, soft, nonsticky, nonplastic; few very fine roots throughout; few fine tubular pores; 30 percent distinct clay bridging between sand grains and 35 percent distinct clay films on all faces of peds; 1 percent fine threadlike carbonate masses; 2 percent nonflat angular 0.1- to 0.4-inch rock fragments; slight effervescence, by HCl, 1 normal; clear smooth boundary.

Bk—66 to 80 inches; reddish brown (5YR 5/4) crushed, loamy fine sand, yellowish red (5YR 4/6) crushed, moist; 8 percent clay; massive; nonsticky, nonplastic; 1 percent fine threadlike carbonate masses; 2 percent nonflat angular 0.1- to 0.4-inch rock fragments; slight effervescence, by HCl, 1 normal.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Particle-size control section (weighted average):

Clay content: 8 to 12 percent

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Bw horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Bt horizon:

Value: 5 or 6 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Btk horizon:

Value: 5 or 6 dry, 4 to 6 moist

Chroma: 4 to 6, dry or moist

Rock fragments: mixed igneous rock fragments; 0 to 5 percent gravel-sized rock fragments

Bk horizon:

Value: 5 or 6 dry, 4 to 6 moist

Chroma: 4 to 6, dry or moist

Rock fragments: mixed igneous rock fragments; 0 to 5 percent gravel-sized rock fragments

Philder Series

The soils in the Philder series are classified as loamy-skeletal, carbonatic, thermic, shallow Calcic Petrocalcids. These shallow, well drained soils formed in alluvium modified by eolian sands. Permeability is moderately slow above the very slowly permeable petrocalcic horizon and moderate below the petrocalcic horizon. The soils are on erosion remnants on fan piedmonts. Slope is 2 to 5 percent. Elevation is 4,700 to 6,000 feet. Mean annual precipitation is about 13 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Philder gravelly loam in an area of Philder-Jerag complex, 2 to 5 percent slopes; in Otero County, New Mexico; approximately 30.4 miles east and 8.1 miles north of Orogrande; NW1/4, NE1/4 sec. 13, T. 21 S., R. 13 E. USGS Sixteen Canyon topographic quadrangle; latitude 32 degrees 28 minutes 58 seconds north and longitude 105 degrees 34 minutes 10 seconds west. UTM zone 13, 446211E, 3594420N; NAD 27.

A—0 to 2 inches; light brown (7.5YR 6/4) gravelly loam, dark brown (7.5YR 3/4) moist; weak fine angular blocky and weak very fine granular structure; common very fine and fine roots throughout; common very fine vesicular pores; 17 percent calcium carbonate equivalent; 30 percent angular limestone gravel; strong effervescence, by HCl, 3 normal; moderately alkaline; clear smooth boundary.

Bw—2 to 5 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; weak medium and coarse subangular blocky structure; common fine roots throughout; common very fine vesicular pores; 24

percent calcium carbonate equivalent; 35 percent subangular limestone gravel; strong effervescence, by HCl, 3 normal; moderately alkaline; clear smooth boundary.

Bk—5 to 16 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; weak fine angular blocky structure parting to weak fine granular; common fine roots throughout; common very fine vesicular pores; 30 percent calcium carbonate equivalent; few prominent discontinuous carbonate coats on faces of peds; many fine irregular very pale brown (10YR 8/2) carbonate concretions between peds; 15 percent subrounded limestone cobbles, 40 percent subrounded limestone gravel; strong effervescence, by HCl, 3 normal; moderately alkaline; abrupt smooth boundary.

Bkm1—16 to 31 inches; white (10YR 8/1) very pale brown (10YR 7/4) moist; indurated caliche, many white (10YR 8/1) carbonate concretions; 25 percent subrounded limestone cobbles, 35 percent subrounded limestone gravel; violent effervescence, by HCl, 3 normal; clear smooth boundary.

Bkm2—31 to 56 inches; white (10YR 8/1) very pale brown (10YR 7/4) moist; many white (10YR 8/1) carbonate concretions; 30 percent subrounded limestone gravel, 30 percent subrounded limestone cobbles, 20 percent subrounded limestone stones; violent effervescence, by HCl, 3 normal; abrupt smooth boundary.

2Bk'2—56 to 80 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) moist; moderate medium angular blocky structure; common fine roots throughout; common very fine vesicular pores; 30 percent calcium carbonate equivalent; few distinct patchy carbonate coats on faces of peds; common fine irregular very pale brown (10YR 8/2) carbonate concretions between peds; violent effervescence, by HCl, 3 normal; moderately alkaline.

Range in Characteristics

Soil moisture: An aridic soil moisture regime bordering on ustic. The soil moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Soil temperature: 59 to 62 degrees F.

Depth to calcic horizon: 4 to 14 inches

Depth to petrocalcic horizon: 14 to 20 inches

Particle-size control section (weighted average):

Clay content: 18 to 25 in the particle-size control section

Rock fragments: Averages more than 35 percent but individual horizons may have less

A horizon:

Hue: 7.5YR or 10YR

Value: 3 to 6 dry, 3 or 4 moist

Chroma: 4 or 5, dry or moist

Rock fragments: 20 to 45 percent of pebble size

Bw horizon:

Hue: 7.5YR or 10YR

Value: 3 to 6 dry, 4 or 5 moist

Chroma: 4 or 5, dry or moist

Texture: sandy clay loam or loam, or gravelly or very gravelly analogs

Rock fragments: 20 to 50 percent of pebble size and 0 to 10 percent of cobble size

Bk horizon:

Hue: 7.5YR or 10YR

Value: 3 to 6 dry, 3 or 4 moist

Chroma: 3 to 6, dry or moist

Texture: sandy clay loam or loam, or very gravelly analogs

Rock fragments: 35 to 60 percent of pebble size and 10 to 30 percent of cobble size

Bkm horizon:

Hue: 7.5YR or 10YR

Value: 7 or 8 dry, 6 or 7 moist

Chroma: 1 to 4, dry or moist

Rock fragments: 30 to 60 percent of pebble size, 10 to 30 percent of cobble size, and 0 to 20 percent stone size

2Bk' horizon:

Hue: 7.5YR or 10YR

Value: 7 or 8 dry, 5 or 6 moist

Chroma: 1 to 4, dry or moist

Texture: loam or clay loam

Piquin Series

The soils in the Piquin series are classified as loamy-skeletal, mixed, superactive thermic Typic Haplocalcids. These very deep, somewhat excessively drained, moderately rapidly permeable soils formed in alluvium from mixed igneous sources. The soils are on relict terraces. Slope is 5 to 15 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Piquin very gravelly sandy loam in an area of Piquin very gravelly sandy loam, 5 to 15 percent slopes; in Dona Ana County, New Mexico; approximately 3.7 miles west and 19.3 miles south of White Sands; 1,480 feet south and 70 feet west of the

northeast corner of sec. 33, T. 25 S., R. 4 E. USGS Anthony topographic quadrangle; latitude 32 degrees, 05 minutes, 32 seconds north and longitude 106 degrees, 31 minutes, 46.95 seconds west. UTM zone 13S, 355646E, 3551494N; NAD 27.

Ak—0 to 2 inches; light brown (7.5YR 6/3) crushed, very gravelly sandy loam, dark brown (7.5YR 4/3) crushed, moist; 10 percent clay; weak fine granular structure; loose; nonsticky and nonplastic; common fine roots throughout; 5 percent medium irregular carbonate masses in matrix; 3 percent coarse irregular carbonate nodules in matrix; 40 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel; strong effervescence, by HCl, 1 normal; strongly alkaline; gradual smooth boundary.

Bk1—2 to 9 inches; light brown (7.5YR 6/3) crushed, gravelly sandy loam, dark brown (7.5YR 4/4) moist; 10 percent clay; weak fine granular structure; soft, very friable; nonsticky and nonplastic; common fine roots throughout; few fine dendritic tubular pores; 5 percent coarse irregular carbonate masses in matrix; 5 percent coarse irregular carbonate nodules in matrix; 30 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel; strong effervescence, by HCl, 1 normal; moderately alkaline; gradual smooth boundary.

Bk2—9 to 19 inches; light brown (7.5YR 6/3) crushed, very gravelly sandy loam, dark brown (7.5YR 4/4) crushed, moist; 12 percent clay, weak fine granular structure; soft, very friable; nonsticky and nonplastic; few fine roots throughout, few fine dendritic tubular pores; 10 percent coarse irregular carbonate masses in matrix; 5 percent coarse irregular carbonate nodules in matrix; 40 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel; strong effervescence, by HCl, 1 normal; moderately alkaline; gradual smooth boundary.

Bk3—19 to 30 inches; light brown (7.5YR 6/3) crushed, very gravelly sandy loam, dark brown (7.5YR 4/4) crushed, moist; 10 percent clay; weak fine granular structure; soft, very friable; nonsticky and nonplastic; few fine roots throughout; few fine dendritic tubular pores; 5 percent medium irregular carbonate masses in matrix; 5 percent coarse irregular carbonate nodules in matrix; 40 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel; strong effervescence, by HCl, 1 normal; moderately alkaline; gradual smooth boundary.

Bk4—30 to 50 inches; light brown (7.5YR 6/3) crushed, gravelly sandy loam, dark brown (7.5YR 4/4) crushed, moist; 12 percent clay, weak granular structure; soft, very friable; nonsticky and nonplastic; few fine roots throughout, few fine dendritic tubular pores; 3 percent fine irregular carbonate masses in matrix; 3 percent medium irregular carbonate nodules in matrix; 30

percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel; strong effervescence, by HCl, 1 normal; moderately alkaline; abrupt smooth boundary.

C—50 to 80 inches; light brown (7.5YR 6/3) crushed, gravelly coarse sand, dark brown (7.5YR 4/4) crushed moist; 2 percent clay; single grain; loose; nonsticky and nonplastic; 20 percent nonflat subrounded 0.1- to 3-inch mixed igneous gravel; noneffervescent by HCl, 1 normal; moderately alkaline.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to calcic horizon: 2 to 10 inches

Particle-size control section (weighted average):

Clay content: 8 to 15 percent

Rock fragments: 35 to 45 percent

Calcium carbonate equivalent: 5 to 10 percent (less than 2 mm fraction)

Reaction: moderately alkaline to strongly alkaline

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture modifier: gravelly or very gravelly

Rock fragments: 30 to 45 percent mixed igneous gravel

Bk horizons:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Texture: fine sandy loam or sandy loam

Texture modifier: gravelly or very gravelly

Rock fragments: 30 to 45 percent mixed igneous gravel

C horizon:

Hue: 7.5YR or 10YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 3 to 6, dry or moist

Texture: sand or coarse sand

Rock fragments: 15 to 30 percent mixed igneous gravel

Poblano Series

The soils in the Poblano series are classified as clayey-skeletal, mixed, superactive, mesic Pachic Argiustolls. These moderately deep, well drained,

slowly permeable soils formed in colluvium and alluvium from monzonite. The soils are on mountain flanks and bases. Slope is 5 to 35 percent. Elevation is 5,800 to 6,800 feet. Mean annual precipitation is about 15 inches, and the mean annual temperature is about 56 degrees F. The frost-free period is 130 to 170 days.

Typical Pedon

Typical pedon of Poblano very cobbly clay loam in an area of Poblano very cobbly clay loam, 5 to 15 percent slopes; in Dona Ana County, New Mexico; approximately 3.7 miles west and 5.7 miles south of White Sands; 4,600 feet east and 500 feet north of the southwest corner of sec. 21, T. 23 S., R. 4 E. USGS Organ Peak topographic quadrangle; latitude 32 degrees, 17 minutes, 22 seconds north and longitude 106 degrees 32 minutes 34 seconds west. UTM zone 13 354712E, 3573485N; NAD 27.

A—0 to 2 inches; brown (7.5YR 4/2) crushed, very cobbly clay loam, very dark brown (7.5YR 2.5/2) crushed, moist; weak fine granular structure; slightly hard, friable; slightly sticky and slightly plastic; common fine roots throughout; 34 percent clay; 20 percent nonflat subrounded 0.1- to 3-inch monzonite gravel, 15 percent nonflat subrounded 3- to 10-inch monzonite cobbles, 10 percent nonflat subrounded 10- to 24-inch monzonite stones and 10 percent nonflat subrounded greater than 24-inch monzonite boulders; noneffervescent, by HCl, 1 normal; neutral; clear smooth boundary.

Bt1—2 to 6 inches; brown (7.5YR 4/2) crushed, very gravelly clay, very dark brown (7.5YR 2.5/3) crushed, moist; moderate medium subangular blocky structure; hard, extremely firm; moderately sticky and moderately plastic; few fine and medium roots throughout; few fine dendritic tubular pores; 42 percent clay; 20 percent patchy distinct clay films on faces of peds; 20 percent nonflat subrounded 0.1- to 3-inch monzonite gravel, 15 percent nonflat subrounded 3- to 10-inch monzonite cobbles and 5 percent nonflat subrounded 10- to 24-inch monzonite stones; noneffervescent, by HCl, 1 normal; neutral; gradual wavy boundary.

Bt2—6 to 11 inches; brown (7.5YR 4/3) crushed, very cobbly clay, very dark brown (7.5YR 3/2) crushed, moist; moderate coarse subangular blocky structure; very hard, extremely firm; very sticky and very plastic; few fine roots throughout; few fine dendritic tubular pores; 48 percent clay; 40 percent continuous prominent clay films on faces of peds; 10 percent nonflat subrounded 0.1- to 3-inch monzonite gravel, 15 percent nonflat subrounded 3- to 10-inch monzonite cobbles and 15 percent nonflat subrounded 10- to 24-

inch monzonite stones; noneffervescent, by HCl, 1 normal; neutral; gradual wavy boundary.

Bt3—11 to 27 inches; brown (7.5YR 5/2) crushed, very gravelly clay, dark brown (7.5YR 3/3) crushed, moist; moderate coarse subangular blocky structure; very hard extremely, firm; very sticky and very plastic; few fine roots throughout; few fine dendritic tubular pores; 50 percent clay; 50 percent continuous prominent clay films on faces of peds; 20 percent nonflat subrounded 0.1- to 3-inch monzonite gravel and 15 percent nonflat subrounded 3- to 10-inch monzonite cobbles; noneffervescent, by HCl, 1 normal; neutral; abrupt smooth boundary.

Btk—27 to 34 inches; brown (7.5YR 5/4) crushed, gravelly clay, brown (7.5YR 4/4) crushed, moist; weak coarse subangular blocky structure; very hard, extremely firm; very sticky and very plastic; few fine roots throughout; few fine dendritic tubular pores; 45 percent clay; 5 percent medium, irregular calcium carbonate masses on faces of peds; 20 percent patchy prominent clay films on faces of peds; 15 percent nonflat subrounded 0.1- to 3-inch monzonite gravel; slight effervescence with violent effervescence in patches, by HCl, 1 normal; moderately alkaline; gradual wavy boundary.

Crk—34 to 42 inches; reddish yellow; coarsely fractured weathered monzonite bedrock; 5 percent medium, irregular calcium carbonate masses in matrix; abrupt smooth boundary.

R—42 inches; thickly bedded massive monzonite.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 55 to 59 degrees F.

Depth to lithic contact: 40 to 60 inches

Depth to paralithic contact: 30 to 40 inches

Depth to argillic horizon: 0 to 4 inches

Thickness of mollic epipedon: 20 to 30 inches

Particle-size control section (weighted average):

Clay content: 40 to 60 percent

Rock fragments: 35 to 55 percent

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2.5 or 3 moist

Chroma: 1 to 3, dry or moist

Rock fragments: monzonite rock fragments; 35 to 55 percent total rock fragments; 10 to 30 percent gravel; 10 to 20 percent cobbles, 10 to 15 percent stones, and 5 to 15 percent boulders

Bt horizons:

Hue: 5YR or 7.5YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Texture modifier: gravelly, very gravelly, very cobbly, or very stony

Rock fragments: monzonite rock fragments; 25 to 55 percent total rock fragments; 10 to 35 percent gravel; 5 to 25 percent cobbles and 0 to 15 percent stones.

Btk horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 4 or 6, dry or moist

Texture modifier: gravelly or very gravelly

Rock fragments: monzonite rock fragments; 15 to 25 percent total rock fragments; 10 to 25 percent gravel; 0 to 5 percent cobbles.

Texture: clay loam and clay

Reduff Series

The soils in the Reduff series are classified as loamy-skeletal, mixed, nonacid, superactive thermic Lithic Ustic Torriorthents. These very shallow and shallow, well drained, moderately slowly permeable soils formed in colluvium from tuff. The soils are on mountain flanks and tops. Slope is 35 to 90 percent. Elevation is 4,000 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Reduff very gravelly loam in an area of Reduff very gravelly loam, 35 to 65 percent slopes; in Dona Ana County, New Mexico; approximately 9.6 miles south and 5.1 miles west of White Sands; 290 feet west and 700 feet north of the southeast corner of sec. 7, T. 24 S., R. 4 E. USGS Bishop Cap topographic quadrangle; latitude 32 degrees 13 minutes 48 seconds north and longitude 106 degrees 33 minutes 59 seconds west. UTM zone 13, 352620E, 3566730N; NAD 27.

A—0 to 2 inches; brown (7.5YR 4/4) crushed very gravelly loam, dark brown (7.5YR 4/3) crushed, moist; 20 percent clay; weak medium subangular blocky and weak fine subangular blocky structure; 10 percent nonflat subrounded indurated 3- to 10-inch tuff rock fragments and 30 percent nonflat subrounded indurated

0.1- to 3-inch tuff rock fragments, noneffervescent, by HCl, 1 normal; gradual wavy boundary.

C1—2 to 7 inches; brown (7.5YR 4/4) crushed, extremely gravelly loam, dark brown (7.5YR 4/3) crushed, moist; 22 percent clay; weak fine granular and weak fine subangular blocky structure; 5 percent nonflat subrounded indurated 10- to 24-inch tuff rock fragments and 10 percent nonflat subrounded indurated 3- to 10-inch tuff rock fragments and 50 percent nonflat subrounded indurated 0.1- to 3-inch tuff rock fragments, noneffervescent, by HCl, 1 normal; gradual wavy boundary.

C2—7 to 14 inches; brown (7.5YR 4/4) crushed, very gravelly loam, dark brown (7.5YR 4/3) crushed, moist; 22 percent clay; weak fine granular and weak fine subangular blocky structure; 5 percent nonflat subrounded indurated 10- to 24-inch tuff rock fragments and 5 percent nonflat subrounded indurated 3.0- to 10-inch tuff rock fragments and 45 percent nonflat subrounded indurated 0.1- to 3.0-inch tuff rock fragments, noneffervescent, by HCl, 1 normal; abrupt wavy boundary.

R—14 inches; bedrock.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Depth to bedrock: 4 to 20 inches

Particle-size control section (weighted average):

Clay content: 20 to 27 percent

Rock fragments: 35 to 80 percent

A horizon:

Hue: 5YR or 7.5YR

Value: 4 to 6, dry or moist

Chroma: 2 to 4, dry or moist

Rock fragments: limestone rock fragments; 35 to 50 percent total rock fragments; 25 to 40 percent gravel; 0 to 10 percent cobbles

C horizon:

Hue: 5YR or 7.5YR

Value: 4 to 6, dry or moist

Chroma: 2 to 4, dry or moist

Rock fragments: limestone rock fragments; 35 to 80 percent total rock fragments; 35 to 70 percent gravel; 0 to 10 percent cobbles; 0 to 5 percent stones

Reyab Series

The soils in the Reyab series are classified as fine-silty, mixed, superactive, thermic Ustic Haplocambids. These very deep, well drained, moderately slowly permeable soils formed in alluvium from limestone. The soils are on fan aprons and inset fans on fan piedmonts. Slope is 0 to 5 percent. Elevation is 4,200 to 6,000 feet. Mean annual precipitation is about 12 inches, and the mean annual temperature is about 61 degrees F. The frost-free period is 140 to 210 days.

Typical Pedon

Typical pedon of Reyab loam; in Otero County, New Mexico; on Otero Mesa approximately 11.8 miles south on County Road 506 from the guard station at the east gate of the McGregor Missile Range and 250 feet west of the road; NW1/4, NW1/4 sec. 15, T.24 S., R.13 E. USGS Alamo Mountain NE topographic quadrangle; latitude 32 degrees 13 minutes 21.9 seconds north and longitude 105 degrees 36 minutes 26 seconds west. UTM zone 13, 442782E, 3565100N; NAD 27.

A—0 to 4 inches; light gray (10YR 7/2) loam, dark brown (10YR 3/3) moist; weak medium platy in the upper part and weak medium and fine subangular blocky structure in the lower part; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; strong effervescence, by HCl, 1 normal; lime disseminated; moderately alkaline; clear smooth boundary.

Bw1—4 to 12 inches; light gray (10YR 7/2) silt loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; strong effervescence, by HCl, 1 normal; lime disseminated; moderately alkaline; gradual smooth boundary.

Bw2—12 to 25 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak coarse and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; strong effervescence, by HCl, 1 normal; lime disseminated; moderately alkaline; gradual smooth boundary.

C—25 to 80 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; strong

effervescence, by HCl, 1 normal; lime disseminated; moderately alkaline.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The soil moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Particle-size control section (weighted average):

Clay content: 18 to 35 percent

A horizon:

Value: 5 to 7 dry, 3 to 5 moist

Chroma: 2 or 3, dry or moist

Bw horizon:

Hue: 10YR or 7.5YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

Texture: silt loam or silty clay loam

C horizon:

Hue: 10YR or 7.5YR

Value: 5 to 7, dry or moist

Chroma: 2 to 4, dry or moist

Texture: silt loam or silty clay loam

Rotagilla Series

The soils in the Rotagilla series are classified as loamy-skeletal, mixed, superactive, mesic Lithic Haplustolls. These very shallow and shallow, well drained, moderately slowly permeable soils formed in colluvium from monzonite. The soils are on mountain tops and flanks. Slope is 35 to 90 percent. Elevation is 5,800 to 6,800 feet. Mean annual precipitation is about 15 inches, and the mean annual temperature is about 56 degrees F. The frost-free period is 130 to 170 days.

Typical Pedon

Typical pedon of Rotagilla very gravelly loam in an area of Rotagilla very gravelly loam, 35 to 65 percent slopes; in Dona Ana County, New Mexico; approximately 3.5 miles west and 6 miles south of White Sands; 1,800 feet east and 200 feet north of the southwest corner of sec. 21, T. 23 S., R. 4 E. USGS Organ Peak topographic quadrangle; latitude 32 degrees 17 minutes 11 seconds north and longitude 106 degrees 32 minutes 55 seconds west. UTM zone 13, 354440E, 3573010N; NAD 27.

A—0 to 2 inches; reddish brown (5YR 4/3) crushed,

very gravelly loam, dark reddish brown (5YR 3/2) crushed, moist; 18 percent clay; weak fine granular structure; loose; nonsticky and nonplastic; few fine roots throughout; and 49 percent nonflat subangular 0.1- to 3-inch monzonite gravel, 10 percent nonflat subangular 3- to 10-inch monzonite cobbles; noneffervescent, by HCl, 1 normal; slightly acid; clear smooth boundary.

Bw1—2 to 7 inches; reddish brown (5YR 4/3) crushed, very gravelly loam, dark reddish brown (5YR 3/3) crushed, moist; 22 percent clay; weak medium subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 40 percent nonflat subangular 0.1- to 3-inch monzonite gravel, 15 percent nonflat subangular 3- to 10-inch monzonite cobbles; noneffervescent, by HCl, 1 normal; moderately acid; gradual smooth boundary.

Bw2—7 to 16 inches; reddish brown (5YR 4/3) crushed, very gravelly loam, dark reddish brown (5YR 3/3) crushed, moist; 24 percent clay; weak fine subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 40 percent nonflat subangular 0.1- to 3-inch monzonite gravel, 5 percent nonflat subangular 3- to 10-inch monzonite cobbles; noneffervescent, by HCl, 1 normal; moderately acid; abrupt smooth boundary.

R—16 inches; thickly bedded massive monzonite.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 55 to 59 degrees F.

Thickness of mollic epipedon: 8 to 20 inches

Depth to lithic contact: 8 to 20 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 35 to 60 percent

Reaction: moderately acid to slightly acid

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Rock fragments: monzonite rock fragments; 50 to 60

percent total rock fragments, 45 to 60 percent gravel, 0 to 15 percent cobbles

Bw horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 2 to 4 moist

Chroma: 1 to 4, dry or moist

Rock fragments: monzonite rock fragments; 35 to 60 percent total rock fragments, 30 to 60 percent gravel, 0 to 15 percent cobbles.

Texture: loam or clay loam

Salado Series

The soils in the Salado series are classified as fine-loamy, mixed, superactive, thermic Ustic Haplocalcids. These very deep, well drained, moderately slowly permeable soils formed in calcareous alluvium. The soils are on fan piedmonts. Slope is 1 to 3 percent. Elevation is 4,700 to 6,000 feet. Mean annual precipitation is about 13 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Salado loam in an area of Salado loam, 1 to 3 percent slopes; in Otero County, New Mexico; approximately 27 miles east and 1.9 miles north of Orogrande; 2,250 feet north and 2,400 feet west of the southeast corner of sec. 8, T. 22 S. R. 13 E. USGS El Paso Draw, NM topographic quadrangle; latitude 32 degrees 24 minutes 18 seconds north and longitude 105 degrees 38 minutes 12 seconds west. UTM zone 13, 440110E, 3585300N; NAD 27.

A1—0 to 1 inch; light brown (7.5YR 6/3) crushed, loam, dark brown (7.5YR 3/3) crushed, moist; moderate fine granular structure; many fine roots throughout; few fine low continuity vesicular pores; 5 percent subrounded limestone gravel; strong effervescence on faces of peds and in pores, by HCl, 3 normal; slightly alkaline; 6 percent calcium carbonate equivalent; clear smooth boundary.

A2—1 to 5 inches; light brown (7.5YR 6/3) crushed, loam, brown (7.5YR 4/3) crushed, moist; weak medium subangular blocky structure; many fine roots throughout; few fine low continuity vesicular pores; 5 percent subrounded limestone gravel; strong effervescence on faces of peds and in pores, by HCl, 3 normal; slightly alkaline; 7 percent calcium carbonate equivalent; clear smooth boundary.

Bw—5 to 13 inches; light brown (7.5YR 6/3) crushed, silt loam, brown (7.5YR 4/3) crushed, moist; weak fine

and medium angular blocky structure; many fine roots throughout; few fine low continuity vesicular pores; 5 percent subrounded limestone gravel; strong effervescence on faces of peds and in pores, by HCl, 3 normal; slightly alkaline; 11 percent calcium carbonate equivalent; clear smooth boundary.

Bk1—13 to 27 inches; light brown (7.5YR 6/4) crushed, silt loam, brown (7.5YR 4/3) crushed, moist; moderate medium angular blocky structure; common fine roots between peds; few fine low continuity vesicular pores; 5 percent subrounded limestone gravel; strong effervescence on faces of peds and in pores, by HCl, 3 normal; moderately alkaline; 12 percent calcium carbonate equivalent; clear smooth boundary.

Bk2—27 to 41 inches; pink (7.5YR 7/3) crushed, loam, light brown (7.5YR 6/4) crushed, moist; moderate medium and coarse angular blocky structure; few very fine and fine roots between peds; few fine low continuity vesicular pores; 5 percent subrounded limestone gravel; violent effervescence on faces of peds and in pores, by HCl, 3 normal; moderately alkaline; 42 percent calcium carbonate equivalent; clear smooth boundary.

Bk3—41 to 70 inches; pink (7.5YR 7/3) crushed, clay loam, light brown (7.5YR 6/4) crushed, moist; strong fine and medium angular blocky structure; few very fine roots between peds; few fine low continuity vesicular pores; 5 percent subrounded limestone gravel; violent effervescence on faces of peds and in pores, by HCl, 3 normal; moderately alkaline; 30 percent calcium carbonate equivalent; clear smooth boundary.

Bk4—70 to 80 inches; light brown (7.5YR 6/3) crushed, sandy clay loam, brown (7.5YR 5/4) crushed, moist; 5 percent subrounded limestone gravel; violent effervescence on faces of peds and in pores, by HCl, 3 normal; moderately alkaline; 21 percent calcium carbonate equivalent; clear smooth boundary.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Depth to calcic horizon: 20 to 40 inches

Rock fragments: 0 to 10 percent gravel size limestone rock fragments throughout

Particle-size control section (weighted average):

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 15 to 40 percent

A horizon:

Hue: 7.5YR or 10YR

Value: 4 to 6 dry, 3 to 6 moist

Chroma: 2 to 4, dry or moist

Bw horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 2 to 4, dry or moist

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

Bk horizon:

Hue: 5YR to 10YR

Value: 6 to 8 dry, 4 to 6 moist

Chroma: 2 to 6, dry or moist

Texture: loam, silt loam, clay loam, or silty clay loam
or below 60 inches it may be sandy clay loam**Silktassel Series**

The soils in the Silktassel series are classified as loamy-skeletal, mixed, superactive, thermic Aridic Lithic Argiustolls. These shallow, well drained, moderately slowly permeable soils formed in colluvium from tuff. The soils are on mountain tops and flanks. Slope is 35 to 95 percent. Elevation is 4,700 to 6,300 feet. Mean annual precipitation is about 14 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Silktassel very gravelly loam in an area of Silktassel very gravelly loam, 35 to 65 percent slopes; in Dona Ana County, New Mexico; approximately 5.6 miles west and 6 miles south of White Sands; 2,590 feet west and 210 feet south of the northeast corner of sec. 30, T. 23 S., R. 4 E. USGS Organ Peak topographic quadrangle; latitude 32 degrees 17 minutes 8.55 seconds north and longitude 106 degrees 34 minutes 16.1 seconds west. UTM zone 13, 352048E, 35703000 N; NAD 27.

A1—0 to 3 inches; brown (7.5YR 4/3) crushed, very gravelly loam, dark brown (7.5YR 3/3) crushed, moist; 24 percent clay; weak fine granular structure; loose; slightly sticky and slightly plastic; common fine roots throughout; 40 percent nonflat angular 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; neutral; clear smooth boundary.

A2—3 to 7 inches; brown (7.5YR 4/2) crushed, very gravelly loam, dark brown (7.5YR 3/2) crushed, moist; 22 percent clay; weak medium subangular blocky

structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 40 percent nonflat angular 0.1- to 3-inch tuff gravel, 10 percent nonflat angular 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; neutral; clear smooth boundary.

Bt1—7 to 12 inches; brown (7.5YR 5/4) crushed, very gravelly clay loam, dark brown (7.5YR 3/4) crushed, moist; 32 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 15 percent patchy faint clay films on faces of peds; 40 percent nonflat subangular 0.1- to 3-inch tuff gravel, 15 percent nonflat subangular 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; neutral; gradual smooth boundary.

Bt2—12 to 17 inches; strong brown (7.5YR 4/6) crushed, extremely gravelly clay loam, dark brown (7.5YR 3/4) crushed, moist; 28 percent clay; moderate fine subangular blocky structure; moderately hard, friable, moderately sticky and moderately plastic; few fine roots throughout; few fine dendritic tubular pores; 15 percent patchy faint clay films on faces of peds; 50 percent nonflat angular 0.1- to 3-inch tuff gravel, 20 percent nonflat angular 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; neutral.

R—17 inches; thickly bedded massive tuff.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Depth to lithic contact: 10 to 20 inches

Thickness of mollic epipedon: 7 to 14 inches

Particle-size control section (weighted average):

Clay content: 27 to 35 percent

Rock fragments: 60 to 75 percent

Reaction: slightly acid to neutral

A horizon:

Hue: 5YR or 7.5YR

Value: 3 to 5 dry, 1 to 3 moist

Chroma: 1 to 3, dry or moist

Rock fragments: tuff rock fragments; 35 to 65 percent gravel-sized rock fragments; 0 to 15 percent cobbles

Bt horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 to 5 moist

Chroma: 4 to 6, dry or moist

Texture modifier: very gravelly or extremely gravelly

Rock fragments: tuff rock fragments; 40 to 75 percent total rock fragments. 30 to 60 percent gravel, 10 to 25 percent cobbles.

Texture: loam, clay loam

Sonic Series

The soils in the Sonic series are classified as loamy-skeletal, carbonatic, thermic Ustifluventic Haplocambids. These very deep, well drained, moderately slowly permeable soils formed in alluvium from limestone. The soils are on inset fans on fan piedmonts. Slope is 1 to 15 percent. Elevation is 4,200 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Sonic very gravelly fine sandy loam in an area of Sonic very gravelly fine sandy loam, 1 to 8 percent slopes; in Otero County, New Mexico; approximately 11.2 miles east and 0.1 miles north of Orogrande; 50 feet west and 925 feet south of the northeast corner of sec. 22, T. 22 S., R. 10 E. USGS Wilde Tank topographic quadrangle; latitude 32 degrees 22 minutes 55.50 seconds north and longitude 105 degrees 53 minutes 51.50 seconds west. UTM zone 13, 415565E, 3582955N; NAD 27.

A—0 to 3 inches; brown (7.5YR 5/4) crushed, very gravelly fine sandy loam, brown (7.5YR 4/4) crushed, moist; 16 percent clay; weak fine granular structure; very friable, soft, nonsticky, nonplastic; few fine roots throughout; 45 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; abrupt wavy boundary.

Bw1—3 to 11 inches; light brown (7.5YR 6/4) crushed, gravelly fine sandy loam, brown (7.5YR 5/4) crushed, moist; 18 percent clay; moderate medium subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 15 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; abrupt wavy boundary.

Bw2—11 to 26 inches; light brown (7.5YR 6/4) crushed, extremely cobbly fine sandy loam, brown (7.5YR 5/4) crushed, moist; 20 percent clay; weak fine

granular structure; friable, soft, nonsticky, nonplastic; few fine roots throughout; 30 percent subrounded 3- to 10-inch limestone rock fragments and 50 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; abrupt wavy boundary.

Bw3—26 to 38 inches; light brown (7.5YR 6/4) crushed, gravelly silt loam, brown (7.5YR 5/4) crushed, moist; 20 percent clay; moderate medium subangular blocky structure; friable, slightly hard, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; 20 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal; abrupt wavy boundary.

Bw4—38 to 80 inches; light brown (7.5YR 6/4) crushed, extremely cobbly silt loam, brown (7.5YR 4/4) crushed, moist; 22 percent clay; weak fine granular structure; very friable, slightly hard, nonsticky, nonplastic; 30 percent subrounded 3- to 9.8-inch limestone rock fragments and 50 percent subrounded 0.1- to 3-inch limestone rock fragments; violent effervescence, by HCl, 1 normal.

Range in Characteristics

Soil moisture: Aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 35 to 60 percent

Calcium carbonate equivalent: 40 to 60 percent (less than 20 mm fraction)

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4, dry or moist

Texture modifier: gravelly or very gravelly

Rock fragments: limestone rock fragments; 15 to 55 percent total rock fragments; 15 to 55 percent gravel, 0 to 10 percent cobbles

Bw horizons:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 or 4, dry or moist

Texture: fine sandy loam, loam, or silt loam

Texture modifier: gravelly, very gravelly, extremely gravelly, very cobbly, or extremely cobbly

Rock fragments: limestone rock fragments; 35 to 60

percent total rock fragments (weighted average); individual horizons may contain 15 to 55 percent gravel; 0 to 35 cobbles

Sotol Series

The soils in the Sotol series are classified as clayey-skeletal, mixed, superactive, thermic Aridic Argiustolls. These moderately deep, well drained, very slowly permeable soils formed in colluvium from monzonite. The soils are on mountain flanks and bases. Slope is 15 to 35 percent. Elevation is 4,700 to 6,300 feet. Mean annual precipitation is about 14 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Sotol gravelly loam in an area of Sotol gravelly loam, 15 to 35 percent slopes; in Dona Ana County, New Mexico; approximately 3.1 miles west and 5.2 miles south of White Sands, 240 feet east and 2,250 feet south of the northwest corner of sec. 22, T. 23 S., R. 4 E. USGS Organ Peak topographic quadrangle; latitude 32 degrees 17 minutes 39.8 seconds north and longitude 106 degrees 31 minutes 43.5 seconds west. UTM zone 13, 356010E, 3573885N; NAD 27.

A—0 to 3 inches; dark reddish gray (5YR 4/2) crushed, gravelly loam, black (5YR 2.5/1) crushed, moist; weak fine subangular structure; slightly, hard, friable; slightly sticky and slightly plastic; many fine roots throughout; 24 percent clay; 20 percent nonflat subrounded 0.1- to 3-inch monzonite gravel and 5 percent nonflat subrounded 3- to 10-inch monzonite cobbles; noneffervescent, by HCl, 1 normal; neutral; clear smooth boundary.

Bt1—3 to 8 inches; reddish brown (5YR 4/3) crushed, very gravelly clay loam, dark reddish brown (5YR 2.5/2) crushed, moist; moderate medium subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; common fine roots throughout; few fine dendritic tubular pores; 32 percent clay; 10 percent patchy faint clay films on faces of peds; 35 percent nonflat subrounded 0.1- to 3-inch monzonite gravel and 5 percent nonflat subrounded 3- to 10-inch monzonite cobbles; noneffervescent, by HCl, 1 normal; neutral; clear smooth boundary.

Bt2—8 to 18 inches; reddish brown (5YR 4/4) crushed, very gravelly clay, dark reddish brown (5YR 3/3) crushed, moist; moderate medium subangular blocky structure; moderately hard, firm; very sticky and very plastic; few fine roots throughout; few fine dendritic

tubular pores; 40 percent clay; 25 percent patchy faint clay films on faces of peds; 50 percent nonflat subrounded 0.1- to 3-inch monzonite gravel and 5 percent nonflat subrounded 3- to 10-inch monzonite cobbles; noneffervescent, by HCl, 1 normal; neutral; clear smooth boundary.

C—18 to 32 inches; reddish brown (5YR 5/4) crushed, very gravelly clay, reddish brown (5YR 4/4) crushed, moist; massive; moderately hard, friable; very sticky and very plastic; very few fine roots throughout; very few fine dendritic tubular pores; 40 percent clay; 30 percent nonflat subrounded 0.1- to 3-inch monzonite gravel and 5 percent nonflat subrounded 3- to 10-inch monzonite cobbles; noneffervescent, by HCl, 1 normal; slightly acid; gradual smooth boundary.

Cr—32 to 38 inches; reddish yellow; coarsely fractured weathered monzonite bedrock.

R—38 inches; thickly bedded massive monzonite.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Depth to argillic horizon: 0 to 4 inches

Depth to lithic contact: 20 to 40 inches

Depth to paralithic contact: 18 to 38 inches

Thickness of mollic epipedon: 10 to 18 inches

Particle-size control section (weighted average):

Clay content: 35 to 55 percent

Rock fragments: 35 to 60 percent

Reaction: slightly acid to neutral

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 to 4, dry or moist

Rock fragments: monzonite rock fragments; 15 to 35 percent total rock fragments; 15 to 25 percent gravel; 0 to 10 percent cobbles

Bt horizons:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 to 4, dry or moist

Rock fragments: monzonite rock fragments; 35 to 60 percent total rock fragments; 35 to 50 percent gravel; 0 to 10 percent cobbles

Texture: clay loam, clay

C horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 4 to 6, dry or moist

Texture modifier: gravelly or very gravelly

Rock fragments: monzonite rock fragments; 15 to 45 percent total rock fragments; 15 to 35 percent gravel; 0 to 10 percent cobbles

Texture: clay loam, clay

Stallone Series

The soils in the Stallone series are classified as loamy-skeletal, mixed, superactive, thermic Aridic Haplustolls. These very deep, well drained, moderately slowly permeable soils formed in debris flow deposits from monzonite. The soils are on bouldery alluvial fans. Slope is 5 to 15 percent. Elevation is 4,500 to 5,500 feet. Mean annual precipitation is about 13 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Stallone extremely bouldery sandy loam in an area of Stallone extremely bouldery sandy loam, 5 to 15 percent slopes; in Dona Ana County, New Mexico; approximately 1.2 miles west and 5.6 miles south of White Sands, 1,629 feet north and 440 feet west of the southeast corner of sec. 23, T. 23 S., R. 4 E. USGS Davies Tank topographic quadrangle; latitude 32 degrees 17 minutes 26 seconds north and longitude 106 degrees 29 minutes 51 seconds west. UTM zone 13, 358980E, 3573438N; NAD 27.

A—0 to 2 inches; reddish brown (5YR 5/3) crushed, extremely bouldery sandy loam; dark reddish brown (5YR 3/3) crushed, moist; 12 percent clay; weak fine granular and weak fine subangular blocky structure; soft, very friable; slightly sticky and nonplastic; common fine roots throughout; 40 percent nonflat subangular indurated 0.1- to 3-inch monzonite gravel, 20 percent nonflat subrounded indurated 3- to 10-inch monzonite cobbles and 25 percent nonflat subrounded indurated greater than 24-inch monzonite boulders; noneffervescent, by HCl, 1 normal; strongly acid, pH 5.1, pH meter 1:1 water; gradual smooth boundary.

Bw—2 to 8 inches; reddish brown (5YR 5/3) crushed, extremely cobbly sandy loam, dark reddish brown (5YR 3/3) crushed, moist; 14 percent clay; weak medium subangular blocky structure; moderately hard, firm; slightly sticky and nonplastic; common fine roots throughout; few fine dendritic tubular pores; 20 percent nonflat subrounded indurated 0.1- to 3-inch monzonite gravel; 40 percent nonflat subrounded indurated 3- to

10-inch cobbles and 20 percent nonflat subrounded indurated greater than 24-inch monzonite boulders; noneffervescent, by HCl, 1 normal; very strongly acid, pH 4.9, pH meter 1:1 water; gradual smooth boundary.

C1—8 to 14 inches; reddish brown (5YR 4/4) crushed, extremely cobbly sandy clay loam, dark reddish brown (5YR 3/3) crushed, moist; 20 percent clay; massive; moderately hard, firm; moderately sticky and moderately plastic; few fine roots throughout; few fine dendritic tubular pores; 30 percent nonflat subrounded indurated 0.1- to 3-inch monzonite gravel, 40 percent nonflat subrounded indurated 3- to 10-inch monzonite cobbles and 15 percent nonflat subrounded indurated greater than 24-inch monzonite boulders; noneffervescent, by HCl, 1 normal; strongly acid, pH 5.5, pH meter 1:1 water; clear smooth boundary.

C2—14 to 34 inches; yellowish red (5YR 5/6) crushed, extremely cobbly sandy clay loam, yellowish red (5YR 4/6) crushed, moist; 24 percent clay; massive; moderately hard, firm; moderately sticky and moderately plastic; few fine roots throughout; few fine dendritic tubular pores; 30 percent nonflat subrounded indurated 0.1- to 3 inch monzonite gravel, 40 percent nonflat subrounded indurated 3- to 10-inch monzonite cobbles and 15 percent nonflat subrounded indurated greater than 24-inch monzonite boulders; noneffervescent, by HCl, 1 normal; moderately acid, pH 5.6, pH meter 1:1 water; clear smooth boundary.

C3—34 to 80 inches; reddish brown (5YR 5/4) crushed, extremely cobbly sandy clay loam, dark reddish brown (5YR3/4) crushed, moist; 24 percent clay; massive; moderately hard, firm; moderately sticky and moderately plastic; few fine roots throughout; few fine dendritic tubular pores; 25 percent nonflat subrounded indurated 0.1- to 3-inch monzonite gravel, 30 percent nonflat subrounded indurated 3- to 10-inch monzonite cobbles and 25 percent nonflat subrounded indurated greater than 24 inch monzonite boulders; noneffervescent, by HCl, 1 normal; very strongly acid, pH 4.7, pH meter 1:1 water.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Thickness of mollic epipedon: 7 to 15 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 60 to 85 percent

Reaction: very strongly acid to moderately acid

A horizon:

Hue: 5YR or 7.5YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Rock fragments: monzonite rock fragments; 65 to 85 percent total rock fragments; 30 to 50 percent gravel, 15 to 25 percent cobbles, and 20 to 30 percent boulders

Bw horizon:

Hue: 5YR or 7.5YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 1 to 3, dry or moist

Rock fragments: monzonite rock fragments; 60 to 85 percent total rock fragments; 15 to 25 percent gravel, 30 to 50 percent cobbles, and 15 to 25 percent boulders

C horizons:

Hue: 5YR or 7.5YR

Value: 3 to 5 dry, 2 to 5 moist

Chroma: 2 to 6, dry or moist

Rock fragments: 65 to 85 percent total rock fragments; 25 to 40 percent gravel, 30 to 50 percent cobbles, and 10 to 30 percent boulders

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

Stealth Series

The soils in the Stealth series are classified as coarse-loamy, mixed, superactive, thermic Arenic Ustic Calciargids. These very deep, well drained, moderately slowly permeable soils formed in eolian sands over alluvium. The soils are on fan piedmonts. Slope is 2 to 5 percent. Elevation is 4,700 to 6,000 feet. Mean annual precipitation is about 13 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Stealth loamy fine sand in an area of Stealth loamy fine sand, 2 to 5 percent slopes; in Otero County, New Mexico; approximately 2.5 miles north and 20.5 miles east of Orogrande; 900 feet east and 400 feet south of the northwest corner of sec. 9, T. 22 S., R. 10 E. USGS El Paso Draw topographic quadrangle; latitude 32 degrees 24 minutes 45 seconds north and longitude 105 degrees 43 minutes 45

seconds west. UTM zone 13, 431456E, 3586202N; NAD 27.

A—0 to 6 inches; reddish yellow (7.5YR 6/6) crushed, loamy fine sand, strong brown (7.5YR 4/6) crushed, moist; 10 percent clay; single grain; nonsticky, nonplastic; common very fine roots throughout; very slight effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

Bw—6 to 21 inches; reddish yellow (7.5YR 6/6) crushed, loamy fine sand, brown (7.5YR 4/4) crushed, moist; 10 percent clay; weak medium subangular blocky structure; nonsticky, nonplastic; common very fine roots throughout; strong effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

Bt—21 to 30 inches; reddish yellow (7.5YR 6/6) crushed, fine sandy loam, brown (7.5YR 4/4) crushed, moist; 15 percent clay; weak medium subangular blocky structure; nonsticky, nonplastic; common fine roots throughout; 35 percent clay bridging between sand grains; strong effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

2Bk1—30 to 46 inches; pink (7.5YR 7/4) crushed, loam, reddish yellow (7.5YR 6/6) crushed, moist; 18 percent clay; weak medium subangular blocky structure; slightly sticky, slightly plastic; common very fine roots throughout; 40 percent coarse irregular carbonate masses; violent effervescence, by HCl, 1 normal; moderately alkaline; clear smooth boundary.

3Bk2—46 to 80 inches; light brown (7.5YR 6/4) crushed, sandy loam, strong brown (7.5YR 5/6) crushed, moist; 18 percent clay; weak medium subangular blocky structure; slightly sticky, slightly plastic; few very fine roots throughout; 10 percent medium irregular carbonate masses; violent effervescence, by HCl, 1 normal; moderately alkaline.

Range in Characteristics

Soil moisture: Aridic moisture regime bordering on ustic. The moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Soil temperature: 59 to 62 degrees F.

Depth to calcic horizon: 20 to 40 inches

Particle-size control section (weighted average):

Clay content: 10 to 18 percent

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 to 6, dry or moist

Bw horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 to 6, dry or moist

Bt horizon:

Hue: 7.5YR or 10YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 to 6, dry or moist

Bk horizon:

Hue: 5YR or 7.5YR

Value: 6 to 8 dry, 5 or 6 moist

Chroma: 2 to 6, dry or moist

Texture: sandy loam or loam

Thaad Series

The soils in the Thaad series are classified as loamy-skeletal, mixed, superactive, mesic Pachic Argiustolls. These deep, well drained, moderately slowly permeable soils formed in colluvium from tuff. The soils are on mountain flanks and bases. Slope is 15 to 35 percent. Elevation is 5,800 to 6,800 feet. Mean annual precipitation is about 15 inches, and the mean annual temperature is about 56 degrees F. The frost-free period is 130 to 170 days.

Typical Pedon

Typical pedon of Thaad extremely gravelly loam in an area of Thaad extremely gravelly loam, 15 to 35 percent slopes; in Dona Ana County, New Mexico; approximately 4.4 miles west and 5.1 miles south of White Sands, 1,210 feet west and 290 feet south of the northeast corner of sec. 20, T. 23 S., R. 4 E. USGS Organ Peak topographic quadrangle; latitude 32 degrees 17 minutes 59 seconds north and longitude 106 degrees 33 minutes 05 seconds west. UTM zone 13, 354050E, 3574490N; NAD 27.

A1—0 to 5 inches; reddish brown (5YR 4/3) crushed, extremely gravelly loam, dark reddish brown (5YR 2.5/2) crushed, moist; 16 percent clay; weak fine granular structure; loose; nonsticky and nonplastic; common fine roots throughout; 65 percent nonflat subrounded 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; strongly acid, pH 5.1, pH meter 1:1 water; gradual smooth boundary.

A2—5 to 12 inches; dark reddish gray (5YR 4/2) crushed, very gravelly loam, black (5YR 2.5/1) crushed, moist; 18 percent clay; weak medium subangular blocky and weak fine subangular blocky structure; slightly hard, friable; slightly sticky and

slightly plastic; many fine roots throughout; common fine dendritic tubular pores; 50 percent nonflat subrounded 0.1- to 3-inch tuff gravel and 5 percent nonflat subrounded 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; very strongly acid, pH 4.9, pH meter 1:1 water; gradual smooth boundary.

Bt1—12 to 21 inches; reddish brown (5YR 4/3) crushed, extremely gravelly loam, dark reddish brown (5YR 3/2) crushed, moist; 24 percent clay; moderate medium subangular blocky structure; moderately hard; firm; slightly sticky and slightly plastic; common fine roots throughout; few fine dendritic tubular pores; 10 percent patchy faint clay films on faces of peds; 50 percent nonflat subrounded 0.1- to 3-inch tuff gravel, 10 percent nonflat subrounded 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; strongly acid, pH 5.1, pH meter 1:1 water; clear smooth boundary.

Bt2—21 to 32 inches; reddish brown (5YR 4/4) crushed, extremely gravelly clay loam, dark reddish brown (5YR 3/4) crushed, moist; 28 percent clay; moderate fine subangular blocky structure; moderately hard, firm; moderately sticky and moderately plastic; few fine roots throughout; few fine dendritic tubular pores; 5 percent patchy faint clay films on faces of peds; 70 percent nonflat subrounded 0.1- to 3-inch tuff gravel, 10 percent nonflat subrounded 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; strongly acid, pH 5.1, pH meter 1:1 water; clear smooth boundary.

Bt3—32 to 44 inches; reddish brown (5YR 4/4) crushed, extremely gravelly clay loam, dark reddish brown (5YR 3/4) crushed, moist; 29 percent clay; moderate fine subangular blocky structure; moderately hard, firm; moderately sticky and moderately plastic, few fine roots throughout; very few fine dendritic tubular pores; 5 percent patchy faint clay films on faces of peds; 55 percent nonflat subrounded 0.1- to 3-inch tuff gravel and 10 percent nonflat subrounded 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; strongly acid, pH 5.1, pH meter 1:1 water.

R—44 inches; thickly bedded massive tuff.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 55 to 59 degrees F.

Depth to lithic contact: 40 to 60 inches
Depth to argillic horizon: 10 to 18 inches
Thickness of mollic epipedon: 20 to 30 inches

Particle-size control section (weighted average):

Clay content: 18 to 35 percent
Rock fragments: 60 to 85 percent
Reaction: very strongly acid to strongly acid

A horizon:

Hue: 5YR or 7.5YR
 Value: 3 or 4 dry, 2 or 3 moist
 Chroma: 1 to 3, dry or moist
 Rock fragments: tuff rock fragments; 50 to 75 percent
 rock fragments; 50 to 65 percent gravel, 0 to 10
 percent cobbles

Bt horizons:

Hue: 5YR or 7.5YR
 Value: 4 or 5 dry, 2 to 4 moist
 Chroma: 2 to 4, dry or moist
 Texture modifier: very gravelly or extremely gravelly
 Rock fragments: tuff rock fragments; 55 to 85 percent
 total rock fragments; 45 to 70 percent gravel, 10 to 15
 percent cobbles
 Texture: loam or clay loam

Tinney Series

The soils in the Tinney series are classified as fine-loamy, mixed, superactive, thermic Ustic Calciargids. These very deep, well drained, moderately slowly permeable soils formed in alluvium. The soils are on inset fans on fan piedmonts. Slope is 1 to 3 percent. Elevation is 4,200 to 5,300 feet. Mean annual precipitation is about 11 inches, and the mean annual temperature is about 62 degrees F. The frost-free period is 170 to 210 days.

Typical Pedon

Typical pedon of Tinney loam in an area of Tinney loam, 1 to 3 percent slopes; in Otero County, New Mexico; approximately 5 miles south and 2.7 miles east of Orogrande; 1,000 feet north and 400 feet west of the southeast corner, sec. 17, T. 23 S., R 9 E. USGS Orogrande South topographic quadrangle; latitude 32 degrees 18 minutes 3.5 seconds north and longitude 106 degrees 2 minutes 12 seconds west. UTM zone 13, 402402E, 3574084N; NAD27.

A—0 to 3 inches; light brown (7.5YR 6/4) crushed, loam, brown (7.5YR 4/4) crushed, moist; moderate thin platy structure parting to moderate very fine granular; slightly sticky and slightly plastic; common very fine roots throughout; 20 percent clay; violent

effervescence, by HCl, 1 normal; abrupt smooth boundary.

Bw—3 to 17 inches; brown (7.5YR 5/4) crushed, loam, brown (7.5YR 4/4) crushed, moist; moderate coarse prismatic structure parting to moderate fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; 20 percent clay; violent effervescence, by HCl, 1 normal; gradual smooth boundary.

2Bt—17 to 36 inches; brown (7.5YR 5/4) crushed, sandy clay loam, brown (7.5YR 4/4) crushed, moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots throughout; few distinct clay films on faces of peds; 25 percent clay; violent effervescence, by HCl, 1 normal; abrupt smooth boundary.

3Bk1—36 to 45 inches; pink (7.5YR 8/3) exterior, and pink (7.5YR 7/3) interior, and pink (7.5YR 7/3) crushed, loam, light brown (7.5YR 6/4) crushed, moist; weak fine subangular blocky structure; very hard, friable, weakly cemented by carbonates, slightly sticky and nonplastic; common very fine roots throughout; 19 percent clay; many prominent continuous carbonate coats; violent effervescence, by HCl, 1 normal; clear smooth boundary.

3Bk2—45 to 57 inches; pink (7.5YR 8/3) exterior, and pink (7.5YR 7/4) interior, and pink (7.5YR 7/3) crushed, loam, light brown (7.5YR 6/4) crushed, moist; moderate fine subangular blocky structure; very hard, friable, very weakly cemented by carbonates, slightly sticky and nonplastic; common very fine roots throughout; 19 percent clay; many prominent discontinuous carbonate coats; violent effervescence, by HCl, 1 normal; clear smooth boundary.

3Bk3—57 to 80 inches; light brown (7.5YR 6/4) crushed, loam, strong brown (7.5YR 5/6) crushed, moist; weak fine subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; 19 percent clay; few prominent discontinuous carbonate coats; violent effervescence, by HCl, 1 normal.

Range in Characteristics

Soil moisture: An aridic moisture regime bordering on ustic. The soil moisture control section is usually dry in all parts less than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 61 to 65 degrees F.

Depth to cambic horizon: 2 to 6 inches

Depth to the argillic horizon: 10 to 20 inches

Depth to calcic horizon: 20 to 40 inches

*Particle-size control section (weighted average):**Clay content:* 18 to 27 percent*Rock fragments:* 0 to 1 percent*A horizon:*

Hue: 5YR or 7.5YR

Value: 4 to 6, dry or moist

Chroma: 3 or 4, dry or moist

Bw horizon:

Hue: 5YR or 7.5YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 to 6, dry or moist

2Bt horizon:

Hue: 5YR or 7.5YR

Value: 5 to 7 dry, 4 to 6 moist

Chroma: 3 to 6, dry or moist

Texture: loam or sandy clay loam

3Bk horizon:

Hue: 5YR or 7.5YR

Value: 6 to 8 dry, 4 to 6 moist

Chroma: 2 to 6, dry or moist

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

Tuftuff Series

The soils in the Tuftuff series are classified as loamy-skeletal, mixed, superactive, thermic Pachic Argiustolls. These moderately deep, well drained, moderately slowly permeable soils formed in colluvium from tuff. The soils are on mountain flanks and bases. Slope is 15 to 35 percent. Elevation is 4,700 to 6,300 feet. Mean annual precipitation is about 14 inches, and the mean annual temperature is about 60 degrees F. The frost-free period is 140 to 180 days.

Typical Pedon

Typical pedon of Tuftuff extremely gravelly loam in an area of Tuftuff extremely gravelly loam, 15 to 35 percent slopes; in Dona Ana County, New Mexico; approximately 5.7 miles west and 6.2 miles south of White Sands, 2,190 feet east and 810 feet south of the northwest corner of sec. 30, T. 23 S., R. 4 E. USGS Organ Peak topographic quadrangle; latitude 32 degrees 17 minutes 03 seconds north and longitude 106 degrees 34 minutes 23 seconds west. UTM zone 13, 351853E, 3572834N; NAD 27.

A1—0 to 3 inches; brown (7.5YR 4/2) crushed, extremely gravelly loam, very dark brown (7.5YR 2.5/2) crushed, moist; 22 percent clay; weak fine subangular blocky structure; soft, very friable; slightly sticky and slightly plastic; many fine roots throughout; 60 percent

nonflat subangular 0.1- to 3-inch tuff gravel; noneffervescent, by HCl, 1 normal; neutral; gradual smooth boundary.

A2—3 to 10 inches; brown (7.5YR 4/2) crushed, very gravelly silt loam, very dark brown (7.5YR 2.5/2) crushed, moist; 22 percent clay; weak medium subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; many fine roots throughout; common fine dendritic tubular pores; 25 percent nonflat subangular 0.1- to 3-inch tuff gravel and 10 percent nonflat subangular 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; neutral; gradual smooth boundary.

A3—10 to 17 inches; brown (7.5YR 4/4) crushed, very gravelly loam, dark brown (7.5YR 3/2) crushed, moist; 24 percent clay; weak medium subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; common fine roots throughout; fine few dendritic tubular pores; 25 percent nonflat subangular 0.1- to 3-inch tuff gravel and 15 percent nonflat subangular 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; neutral; gradual smooth boundary.

Bt1—17 to 30 inches; brown (7.5YR 4/4) crushed, extremely gravelly clay loam, dark brown (7.5YR 3/3) crushed, moist; 28 percent clay; moderate medium subangular blocky structure; moderately hard, firm; moderately sticky and moderately plastic; few fine roots throughout; few fine dendritic tubular pores; 15 percent patchy faint clay films on faces of peds; 45 percent nonflat subangular 0.1- to 3-inch tuff gravel and 15 percent nonflat subangular 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; neutral; clear smooth boundary.

Bt2—30 to 36 inches; brown (7.5YR 5/4) crushed, extremely gravelly clay loam, dark brown (7.5YR 3/4) crushed, moist; 33 percent clay; moderate medium subangular blocky structure; hard, very firm; moderately sticky and moderately plastic; few fine roots throughout; very few fine dendritic tubular pores; 20 percent patchy faint clay films on faces of peds; 50 percent nonflat subangular 0.1- to 3-inch tuff gravel and 25 percent nonflat subangular 3- to 10-inch tuff cobbles; noneffervescent, by HCl, 1 normal; neutral; abrupt smooth boundary.

R—36 inches; thickly bedded massive tuff.

Range in Characteristics

Soil moisture: An ustic moisture regime bordering on aridic. The moisture control section is usually dry in some or in all parts for six-tenths or more of the time that the soil temperature exceeds 41 degrees F. Some

part of the epipedon is moist for more than 90 cumulative days in most years when the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 59 to 62 degrees F.

Depth to lithic contact: 21 to 40 inches

Depth to argillic horizon: 12 to 20 inches

Thickness of mollic epipedon: 20 to 34 inches

Particle-size control section (weighted average):

Clay content: 18 to 35 percent

Rock fragments: 60 to 75 percent

Reaction: slightly acid to neutral

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 to 4 dry, 1 to 3 moist

Rock fragments: tuff rock fragments; 35 to 65 percent total rock fragments; 20 to 65 percent gravel; 0 to 15 percent cobbles

Bt horizons:

Hue: 5YR or 7.5YR

Value: 3 to 5 dry, 2 or 3 moist

Chroma: 2 to 4, dry or moist

Texture modifier: very gravelly or extremely gravelly

Rock fragments: tuff rock fragments; 45 to 75 percent total rock fragments; 35 to 65 percent gravel; 10 to 30 percent cobbles

Wessly Series

The soils in the Wessly series are classified as fine-loamy, mixed, superactive, calcareous, thermic Typic Torriorthents. These very deep, well drained, moderately slowly permeable soils formed in alluvium. The soils are on depressions on alluvial flats on basin floors. Slope is 1 to 3 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Wessly sandy clay loam in an area of Wessly-Copia complex, 1 to 3 percent slopes; in Otero County, New Mexico; approximately 14 miles west and 16.5 miles south of Orogrande; 2,500 feet west and 3,600 feet south of the northeast corner of sec. 16, T. 25 S., R. 6 E. USGS Newman NE topographic quadrangle; latitude 32 degrees 7 minutes 46.26 seconds north and longitude 106 degrees 20 minutes 1.55 seconds west. UTM Zone 13, 374194E, 3555382N; NAD 27.

A—0 to 3 inches; reddish brown (5YR 5/4) crushed, sandy clay loam, reddish brown (5YR 4/4) crushed, moist; 26 percent clay; moderate thin platy structure; slightly hard; violent effervescence, by HCl, 3 normal; slightly alkaline, pH 7.8, pH meter 1:1 water; 4 percent calcium carbonate equivalent; abrupt smooth boundary.

Bk1—3 to 6 inches; reddish brown (5YR 5/4) crushed, sandy clay loam, reddish brown (5YR 4/4) crushed, moist; 22 percent clay; massive; common fine roots throughout; 2 percent fine irregular carbonate masses throughout; slight effervescence, by HCl, 3 normal; slightly alkaline, pH 7.7, pH meter 1:1 water; 2 percent calcium carbonate equivalent; gradual smooth boundary.

Bk2—6 to 16 inches; reddish brown (5YR 5/4) crushed, sandy clay loam, yellowish red (5YR 4/6) crushed, moist; 22 percent clay; massive; common fine roots throughout; 5 percent fine irregular carbonate masses throughout; slight effervescence, by HCl, 3 normal; slightly alkaline, pH 7.5, pH meter 1:1 water; 2 percent calcium carbonate equivalent; clear smooth boundary.

Bk3—16 to 29 inches; reddish brown (5YR 5/4) crushed, sandy clay loam, yellowish red (5YR 4/6) crushed, moist; 24 percent clay; massive; common fine roots throughout; 10 percent fine threads carbonate masses throughout; strong effervescence, by HCl, 3 normal; slightly alkaline, pH 7.5, pH meter 1:1 water; 2 percent calcium carbonate equivalent; gradual smooth boundary.

Bk4—29 to 46 inches; reddish brown (5YR 5/4) crushed, sandy clay loam, yellowish red (5YR 4/6) crushed, moist; 26 percent clay; massive; common fine roots throughout; 15 percent medium threads carbonate masses throughout; strong effervescence, by HCl, 3 normal; slightly alkaline, pH 7.4, pH meter 1:1 water; 2 percent calcium carbonate equivalent; abrupt smooth boundary.

Bk5—46 to 64 inches; pinkish white (5YR 8/2) crushed, sandy clay loam, pink (5YR 7/3) crushed, moist; massive; common very fine roots throughout; 75 percent very coarse irregular moderately cemented carbonate masses throughout; violent effervescence, by HCl, 3 normal; slightly alkaline, pH 7.7, pH meter 1:1 water; 35 percent calcium carbonate equivalent; clear smooth boundary.

Bk6—64 to 80 inches; pink (5YR 8/3) crushed, sandy clay loam, pink (5YR 7/4) crushed, moist; massive; 70 percent very coarse irregular weakly cemented

carbonate masses throughout; violent effervescence, by HCl, 3 normal; slightly alkaline, pH 7.7, pH meter 1:1 water; 30 percent calcium carbonate equivalent.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to calcic horizon: 40 to 60 inches

Particle-size control section (weighted average):

Clay content: 18 to 27 percent

Rock fragments: 0 to 5 percent

Calcium carbonate equivalent: less than 5 percent (less than 2 mm fraction)

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Rock fragments: mixed igneous rock fragments; 0 to 5 percent gravel-sized rock fragments

Bk horizon:

Value: 5 to 8 dry, 4 to 7 moist

Chroma: 2 to 4 dry, 3 to 6 moist

Rock fragments: mixed igneous rock fragments; 0 to 5 percent gravel-sized rock fragments

Yippin Series

The soils in the Yippin series are classified as coarse-loamy, mixed, superactive, thermic Typic Haplocalcids. These very deep, well drained, moderately rapidly permeable soils formed in alluvium from mixed igneous sources. The soils are on erosion remnants on fan piedmonts. Slope is 2 to 5 percent. Elevation is 3,900 to 4,200 feet. Mean annual precipitation is about 9 inches, and the mean annual temperature is about 64 degrees F. The frost-free period is 200 to 240 days.

Typical Pedon

Typical pedon of Yippin loamy sand in an area of Yippin loamy sand, 2 to 5 percent slopes; Dona Ana County, New Mexico; approximately 1.1 miles west and 20.3 miles south of White Sands, 130 feet west and 60 feet north of the southeast corner of sec. 35, T. 25 S., R. 4 E. USGS Anthony topographic quadrangle; latitude 32 degrees 04 minutes 56.37 seconds north and longitude 106 degrees 30 minutes 0.37 seconds west. UTM zone 13, 358424E, 3550391N; NAD 27.

A—0 to 2 inches; light brown (7.5YR 6/3) crushed, loamy sand, dark brown (7.5YR 3/4) crushed, moist; 4

percent clay; weak fine subangular blocky and weak fine granular structure; loose; nonsticky and nonplastic; few fine roots throughout; very slight effervescence, by HCl, 1 normal; slightly alkaline, pH 7.6, pH meter 1:1 water; diffuse smooth boundary.

Bw1—2 to 5 inches; light brown (7.5YR 6/4) crushed, loamy sand, dark brown (7.5YR 4/3) moist; 6 percent clay; weak fine and medium subangular blocky structure; soft, very friable; nonsticky and nonplastic; few fine roots throughout; few fine dendritic tubular pores; 5 percent nonflat subrounded indurated 0.1- to 3-inch mixed igneous gravel; very slight effervescence, by HCl, 1 normal; slightly alkaline, pH 7.7, pH meter 1:1 water; gradual smooth boundary.

Bw2—5 to 15 inches; light brown (7.5YR 6/4) crushed, sandy loam, dark brown (7.5YR 4/3) crushed, moist; 10 percent clay, weak coarse and medium subangular blocky structure; soft, very friable; nonsticky and nonplastic; common fine roots throughout, few fine dendritic tubular pores; 2 percent fine irregular carbonate masses on faces of peds; 5 percent nonflat subrounded indurated 0.1- to 3-inch mixed igneous gravel; strong effervescence, by HCl, 1 normal; slightly alkaline, pH 7.7, pH meter 1:1 water; gradual smooth boundary.

Bk1—15 to 31 inches; light brown (7.5YR 6/4) crushed, sandy loam, strong brown (7.5YR 4/6) crushed moist; 14 percent clay; weak coarse and medium subangular blocky structure; soft, very friable; slightly sticky and slightly plastic; common fine roots throughout; few fine dendritic tubular pores; 5 percent medium irregular carbonate masses on faces of peds; 10 percent nonflat subrounded indurated 0.1- to 3-inch mixed igneous gravel; violent effervescence, by HCl, 1 normal; slightly alkaline, pH 7.7, pH meter 1:1 water; gradual smooth boundary.

Bk2—31 to 45 inches; light brown (7.5YR 6/4) crushed, sandy loam, strong brown (7.5YR 4/6) crushed, moist; 18 percent clay, weak coarse and medium subangular blocky structure; soft, very friable; slightly sticky and slightly plastic; few fine roots throughout, few fine dendritic tubular pores; 2 percent fine irregular carbonate masses on faces of peds; 10 percent nonflat subrounded indurated 0.1- to 3-inch mixed igneous gravel; violent effervescence, by HCl, 1 normal; slightly alkaline, pH 7.7, pH meter 1:1 water; diffuse smooth boundary.

C—45 to 80 inches; light brown (7.5YR 6/4) crushed, sandy loam, strong brown (7.5YR 4/6) crushed moist; 14 percent clay; massive; soft, very friable; slightly sticky and slightly plastic; few fine roots throughout;

few fine dendritic tubular pores; 5 percent nonflat subrounded indurated 0.1- to 3-inch mixed igneous gravel; violent effervescence, by HCl, 1 normal; slightly alkaline, pH 7.7, pH meter 1:1 water.

Range in Characteristics

Soil moisture: Typic aridic soil moisture regime. The moisture control section is usually dry in all parts more than three-fourths of the time that the soil temperature exceeds 41 degrees F.

Mean annual soil temperature: 63 to 67 degrees F.

Depth to calcic horizon: 10 to 20 inches

Particle-size control section (weighted average):

Clay content: 10 to 18 percent

Rock fragments: 0 to 15 percent

Calcium carbonate equivalent: 5 to 10 percent (less than 2 mm fraction)

Reaction: slightly alkaline to moderately alkaline

A horizon:

Hue: 5YR to 10YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Rock fragments: 0 to 5 percent mixed igneous gravel

Bw horizon:

Hue: 5YR to 10YR

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 3 or 4, dry or moist

Texture: fine sandy loam or sandy loam, loamy sand

Rock fragments: 5 to 10 percent mixed igneous gravel

Bk horizons:

Hue: 5YR to 10YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 4 to 6, dry or moist

Texture: fine sandy loam or sandy loam

Rock fragments: 5 to 10 percent mixed igneous gravel

Calcium carbonate equivalent: 5 to 10 percent (less than 2 mm fraction)

C horizon:

Hue: 5YR to 10YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 4 to 6, dry or moist

Texture: fine sandy loam or sandy loam

Rock fragments: 5 to 10 percent mixed igneous gravel

Formation of the Soils

This section discusses the factors of soil formation, relates them to the formation of soils in the survey area, and explains the processes of soil formation.

Soil is a collection of natural bodies occupying the earth's surface. Soil is capable of supporting plants and has properties that are the result of the integrated effects of climate and living matter acting on the parent material conditioned by topography over a period of time. The characteristics of the soil at a given location are determined by the physical and chemical properties, the mineralogical composition of its parent material, the climatic conditions under which the soil material has accumulated or been deposited, the plant and animal life on and in the soil, the topography, and the length of time the soil has been forming. These factors are extremely complex. The effect of any one factor is hard to isolate and identify, but the interactions are important to the nature of the soil. It is convenient, however, to discuss these factors separately and to indicate some of their probable effects on soils formation. These factors are discussed in the following pages.

Time

In relation to the other soil forming factors, time is very important. The length of time that climate and plants and animals act on a given parent material in an area of specific topography determines the degree of development.

Aguena and Oryx soils are young. They have not developed any clear horizons other than a surface horizon. Chaparral, Double, Salado, and Yipin soils have existed long enough to allow some movement of clay and carbonates and to develop a weakly expressed B horizon or a calcic horizon, or both.

Modeama, Poblano, and Sotol soils have very strongly developed horizons. These soils have developed either a thick, well expressed argillic horizon or a very thick surface layer that is high in content of organic matter, or both.

Some soil develop horizons more rapidly than others because of the nature of the parent material. A gypsic horizon can form more rapidly than a calcic horizon when all factors except parent material are equal. Very

few factors remain constant, so they all must be considered when determining the formation and resulting morphology of a specific soil.

Parent Material

The soils in this survey formed in materials derived from many sources, ranging from igneous and sedimentary rock to very recent alluvial and eolian sediment. Because the physical and chemical composition of these materials is highly variable, the nature of the parent materials had a strong effect on the kind of soil that developed and, more importantly, on the rate at which development took place. The nature of these parent materials affected or determined the texture, structure, consistency, color, erodibility, and natural fertility of the soils that formed in them.

The main parent materials of the soils in this area are colluvium, alluvium, and eolian material. These materials are briefly described in the following paragraphs.

Colluvium is material produced by the physical and chemical weathering and breakdown of parent rock. This material has moved by creep, slide, or local wash and is deposited downslope. Dozer soils, which formed in colluvium derived from limestone, have different properties than do the Silktassel soils, which formed in colluvium derived from tuff. The differences are a result of the different physical and chemical composition of the parent rock. Other soils that formed in colluvium are the Deama and Penagua soils, which formed in colluvium derived from limestone, and the Rotagilla and Sotol soils, which formed in colluvium derived from monzonite.

Alluvium is sediment that has been moved by water. It includes sand, gravel, clay, silt, and mixtures of these. The kinds of alluvium and their location depend largely upon the carrying capacity of the streams that deposited them. The Reyab soils formed in geologically recent, medium textured alluvium. These soils have undergone change since the parent sediment was deposited, so they have developed a weakly expressed B horizon. The Cale soils formed in moderately fine textured alluvium, but they are much older and have a strongly expressed Bt horizon and a

thicker A horizon containing much organic matter. The Piquin and Yippin soils formed in gravelly alluvium deposited by ancient fast-flowing rivers.

Eolian material is wind-deposited sand or silt. This material may have been the surface of another soil, but it became parent material upon erosion and redeposition. The Copia soils are the most common and extensive soils that have formed in this material. These soils formed in material deposited on an old alluvial basin floor. The Agüena, Hueco, and Pendero soils formed in recent eolian material. In the Hueco and Pendero soils, some clay has moved downward in the profile, forming a Bt horizon. This indicates that these soils have been in place much longer than the Agüena soils, which have not developed a Bt horizon.

Climate

Climate has a significant influence on the kinds of soil that form and the manner in which they form in different geographic areas. In this survey area, temperature, precipitation, and the wind play important roles in forming soils. When all other factors are equal, variations in climate determine the degree and nature of weathering and soil formation.

Temperature affects the rate of decomposition of parent material, the rate of biological activity, and the rate of chemical change within both the organic and inorganic materials. When the air temperature is low, the soil temperature is correspondingly low. Under this condition, plants and animals reduce their activity. This is also true of the chemical processes that take place within the parent material and soil. Precipitation affects the rate of leaching of soil particles and bases, the rate of biological activity, and the amount of material moved within the soil. It also influences the type of vegetation present, which in turn also modifies the soil. Wind dries and cools the soil. It also adds dust, which contains materials such as calcium carbonate and gypsum. Wind can slow chemical reactions and biological activity by its cooling effect, thus slowing soil formation. It also acts as an erosive agent and forms dunes.

Climate can be either directly or indirectly responsible for variations in soil depth, soil color as a result of chemical change resulting in iron staining, and chemical composition as a result of added calcium carbonate, gypsum, or soil material that is blown in.

The difference between the Dozer and Altuda soils is primarily a result of climate. They both formed in colluvium derived from limestone, but because the Altuda soils receive more moisture, they have developed a darker colored surface layer that is high in content of organic matter. This is a result of rainfall

affecting vegetation, which in turn modifies the soil. More grass grows on the Altuda soils, and the added moisture aids in the biological breakdown and retention of this material in the soil. Since these soils also have lower soil temperatures, it is difficult to identify a specific soil that characteristically is modified by moisture alone.

Wind shaped sand into the coppice dunes on which the Copia and Agüena soils formed. Soil blowing is common, and much surface soil is lost each year. Soil blowing in one place leads to deposition in another, as is evidenced by the carbonate recharge when dust particles are deposited on and partially leached into soils downwind. The depth to which this carbonate is moved in the soil depends upon the amount of precipitation received.

Topography

The two basic parts of topography are slope and aspect. The slope of an area regulates the amount of surface drainage and infiltration when all other factors are the same. Otherwise, its effect depends on or is interrelated with the texture of the soil, the type and density of vegetation present, and the climate. As the slope increases, the potential for erosion increases. The Delnorte soils, for example, commonly are gullied where slope is 12 to 15 percent but are not eroded where slope is 3 to 8 percent. As slope decreases, soil formation processes generally increase because of the greater infiltration and percolation of water through the soil and a more rapid buildup of soil material through alluvial activity. Reyab soils are very deep, but they are still relatively young because they continue to receive soil additions. Steep soils tend to be thin because soil material is eroded away at the rate of development or somewhat more slowly. The Deama, Bissett, and Allamore soils are examples of such steep soils, whereas downslope soils such as the Cale, Condron, and Tinney soils are very deep and well developed.

Aspect is the direction that the slope faces. It affects the available heat present for soil development and the amount of available moisture, although these properties also depend upon other factors. If all other factors are constant, a north-facing slope is cooler than a south-facing slope. This is especially evident near transition zones of temperature and rainfall regimes.

Plant and Animal Life

Plant and animal life includes fungi, bacteria, earthworms, insects, rodents, vegetation, mammals, and man. Plants and animals play an active role in soil

formation. Plant roots grow downward and outward into the soil, displacing the various soil particles, increasing porosity, and distributing organic material which, in turn, encourages the formation of structural units or aggregates. Roots also act to recycle nutrient elements from the lower to the upper soil layers.

The type of plants growing on a parent material determine to a large extent the amount of organic matter that will eventually be in the soil. Also, the vegetation may regulate certain chemical reactions in the soil and the type of micro-organisms that are present.

Soils, such as the Mcnew and Patriot soils, that have formed under desert shrubs generally have low organic matter content. Desert shrubs are generally sparse and contribute little organic matter to the soils,

provide little shade, and afford little protection against erosion. The long periods of sunshine and heat cause the organic matter to decompose rapidly and oxidize.

By introducing grazing animals, man has reduced the amount of vegetation on the soil and thus has gradually decreased the amount of organic matter in the soil. Many activities of living organisms and animals in the soil increase the water intake rate and depth to which moisture can penetrate. Micro-organisms decompose organic matter and release plant nutrients for use by the plant. Insects, rodents, and larger mammals physically mix the soil and in extreme cases may completely alter or change the soil from one kind to another. Humans alter the soil or parent material by adding fertilizer, organic matter, and excess water, and by mechanically manipulating it.

Geology and Geomorphology

By Stephen L. Lacy, Geomorphologist, Natural Resources Conservation Service

The Fort Bliss survey is located within the Basin and Range physiographic province. The province is characterized by isolated, roughly parallel mountain ranges separated by low relief desert basins. The Basin and Range province has been subdivided into five sections, two of which, the Mexican Highland and the Sacramento, are located within the survey area.

The Mexican Highland section covers most of the base from the western boundary to the flanks of the Sacramento Mountains. The Mexican Highland section is described by Fenneman (1931) as extending east of the Rio Grande as far as pronounced basin ranges continue to alternate with basins. Near the 106th meridian, this type of topography ceases, giving way to the faulted and sloping plateaus of the Sacramento section. The basins found at Fort Bliss have elevations of 3,927 to 4,177 feet above sea level, while the highest point in the Organ Mountains is 8,550 feet above sea level. The Mexican Highland section is an arid region receiving around 10 inches of precipitation per year. Rocks decompose slowly here, leading to thin soils on the rocky slopes. Wind and sheet flood erosion tend to carry fine particles into the adjacent basins.

The western boundary of Fort Bliss is partially defined by a range of mountains which stretches northward from El Paso for 250 miles. The mountains are formed from mainly independent fault blocks, 3 to 10 miles in width. The ranges found on Fort Bliss include the Franklin and Organ mountains. These mountains were created through a crustal extension event that was probably associated with the formation of the Rio Grande Rift. In southern New Mexico, the rift is not physiologically distinguishable from the Basin and Range province. The age of the rifting event was Oligocene to Miocene, which occurred about 15 to 18 million years before present and lasted an estimated 10 to 12 million years. There is extensive evidence of low-angle faulting during this time in both the Franklin and Organ mountains (fig. 10). All models of low-angle faulting require a significant amount of crustal

extension. A later phase of high-angle normal faulting which extended from 10 million years before the present to 3 million years before the present caused the uplift of these ranges.

The Franklin Mountains consist of Precambrian-aged granites capped with Paleozoic-aged sedimentary rock sequences. The Precambrian units found in the Franklin Mountains include the Red Bluff Granite, Lanoria Quartzite, Mundy Breccia, and Castner Limestone (undivided), and rhyolite. Castner Range was the only area of the Franklin Mountains mapped for this survey. This area consists of 6,270 acres of dominantly Red Bluff Granite. The major soils found in these mountains are the very shallow and shallow Brewster series on slopes greater than 35 percent and the moderately deep Sotol soils on slopes less than 35 percent. They are skeletal soils with mollic epipedons. The less sloping Sotol soils have argillic horizons. The oldest fossils in New Mexico are found in the Cambrian-aged Bliss Sandstone and consist of algal mats or stromatolites. The remaining sedimentary units consist of dolomite, shale, sandstone, chert, mudstone, conglomerate, and limestone.

The southern portion of the Organ Mountains is found on Fort Bliss. The Organ range encompasses about 150 square miles. The northern half of the Organs is composed of gravels and alluvium of Tertiary-Quaternary age, Tertiary-aged volcanic intrusives, Paleozoic sedimentary rocks, and Precambrian granites. Quartz monzonite intrusions of the Organ Mountain Batholith are the dominant rock types exposed and form the distinct appearance of the mountains on the steep eastern face. The major soils derived from Red Bluff Granite are the very shallow and shallow Brewster series found on slopes greater than 35 percent, and the moderately deep Sotol series found on slopes less than 35 percent. They are skeletal soils with mollic epipedons. The major soils derived from rhyolite are the very shallow and shallow Arbol series, found on slopes greater than 35 percent, and the deep Thaad series, found on slopes less than 35 percent. They are skeletal soils with mollic epipedons. The less sloping Sotol and Thaad soils have argillic horizons. The Organ Mining District is

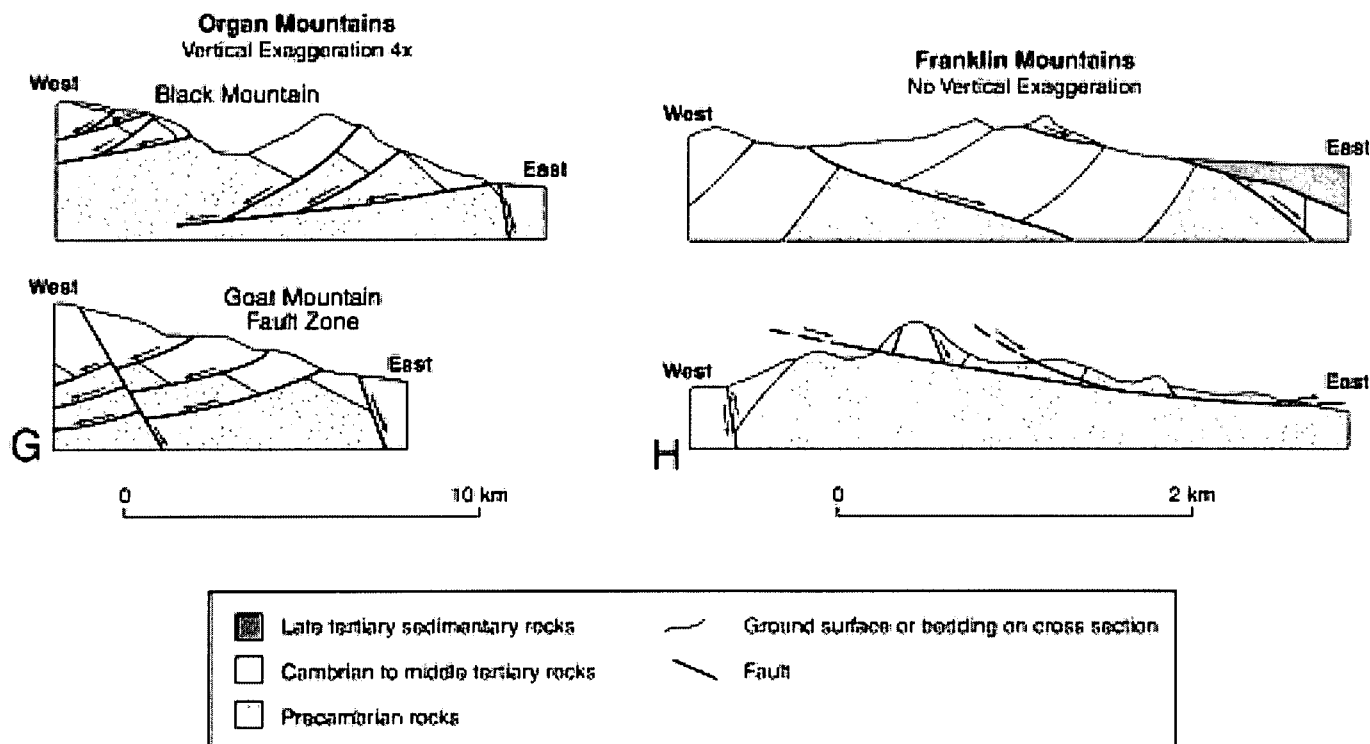


Fig. 10.—Low angle fault in the New Mexico part of the Rio Grande rift. G, cross sections through the east side of the Organ Mountains (4x vertical exaggeration), after Seager (1981); H, cross sections through the northern Franklin Mountains.

located at the northern edge of the mountains and produced over \$2.5 million dollars worth of lead, copper, silver, zinc, and gold ore. The southern half of the Organ Mountains may represent a partially exposed caldron of middle Tertiary age. The caldron is filled with Soledad and Cueva Rhyolite, which dips towards the center of the structure. Small quantities of fluorospar and galena have been mined in the central Organ Mountains. The Paleozoic sedimentary sequences found on Bishop Cap, Tortugas Mountain, and on the structurally high central Organ Mountains may represent the edge of the caldron. These peaks are formed from tilted blocks of stratified marine deposited rocks.

Lying at the eastern edge of the Franklin and Organ ranges is a system of Quaternary-aged faults. It is believed that these faults formed when basin fill warped downward in response to localized extensional forces. According to Seager (1980), most of the faults are shallow features but have the potential for growth as long as the movement on the range-boundary fault of the Franklin-Organ-San Andres Uplift continues. The major soils found in the faults are the Wessely series.

The faults are generally lower than the surrounding soils. Therefore, these soils receive run-on from precipitation resulting in soils that are deep to a calcic horizon.

Two distinct basins are found within Fort Bliss (fig. 11). The Tularosa Basin and the Hueco Basin were both formed through the tension or pull-apart faulting which created the Rio Grande Rift. The Tularosa Basin stretches 125 miles north from the Texas border and is 30 to 40 miles in width. The Tularosa Basin began as a large anticline, with Paleozoic sedimentary rocks arching across from the Sacramento Mountains to the San Andres Mountains. The main portion of the valley was down-faulted between the two adjacent mountain ranges. The Tularosa Basin does not have an outlet for the water coming into the valley and is thus considered a bolson. All the water entering the basin either evaporates or sinks into the unconsolidated material that forms the valley floor. The basin has a gentle southerly slope for its surface topography at a rate of 31 ft per mile. There is also a slope from the east to the west at a rate of 12 ft per mile to closed depressions near the base of the Organ Mountains.

The depth of sediment deposited into the basin exceeds 8,800 feet near the White Sands Missile Range headquarters.

The Hueco Basin lies southward from the Texas-New Mexico border for a distance of 100 miles. Its eastern border is formed by the Hueco Mountains and other ranges to the southeast. The western boundary is formed by mountains in Mexico. The basin is not a typical bolson with centripetal drainage. It has very little drainage of any kind. The Tularosa and Hueco Basins have similar surficial deposits of similar age. The major soils found on the Tularosa and Hueco Basins are the Copia, Elizario, and the Nations series. Copia soils are very deep Psamments and form shrub-

coppice dunes around mesquite bushes. The Elizario soils are found on concave slopes and have a moderately deep calcic horizon. The Nations soils have a moderately deep petrocalcic horizon. The basin slopes toward the south and has fill to a depth of 9,000 feet.

In general, both basins are asymmetrical, west-tilted grabens, which are deepest along their western boundaries (Seager, 1980). The major Quaternary unit in terms of thickness and extent is the Camp Rice Formation. This is the youngest subdivision of the Santa Fe Group. The major facies of the Camp Rice is fluvial sand and gravel deposited by the ancestral Rio Grande during the time when the river terminated in, or

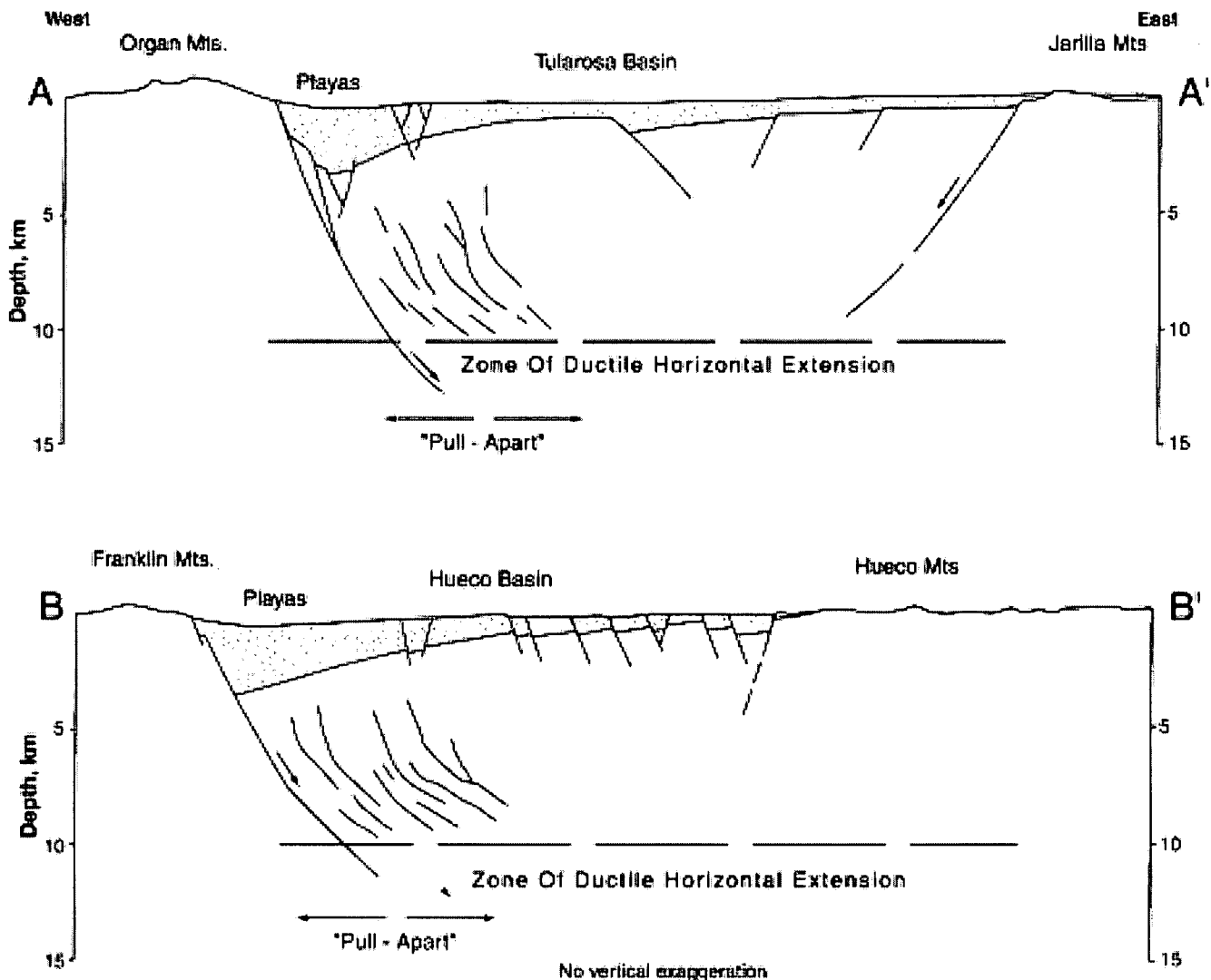


Fig. 11.—Cross sections of the Tularosa and Hueco Basins constructed using available gravity, aeromagnetic, drill hole, and geologic data. Dotted pattern indicates late Cenozoic basin fill. Down-bending of basin fill is thought to be a result of localized pull-apart beneath the western part of the basins. The width of the flexed zone, indicated by the width of the fracture system, suggests that the pull-apart zone is wider beneath the Hueco Basin than beneath the Tularosa Basin.

flowed through, bolsons southeast of El Paso. In the Tularosa and Hueco bolsons, these deposits grade to fine-grained, dominantly lacustrine units with gypsiferous evaporites (Hawley, 1975). The major soils found in gypsiferous deposits are the Malargo soils. The ancestral Rio Grande originally developed in Pliocene time, possibly much earlier than 2 million years before the present. An early river channel in Fillmore Pass between the Organ and Franklin mountains connected the Mesilla and Hueco Bolsons. Subsequent uplift and west-tilting of the Organ-Franklin chain of fault-block mountains diverted the river back into the Mesilla Basin.

During the late Quaternary, the bolsons were characterized by extended periods of general landscape stability and soil formation. These intervals were separated by episodes of surface instability with widespread erosion and sedimentation on piedmont slopes and adjacent valley floors, probably related to pluvial-interpluvial episodes. The evidence for these periods of instability include braided stream deposits with alternating mud flows, relic and Paleozoic horizons, and multiple petrocalcic (caliche) horizons representing periods of alternating wet and dry climate trends since the Pleistocene (2 million years before the present) to the Recent or Holocene. In the southern portion of the Tularosa Basin, over 6,000 feet of valley fill, representing stream sand, rock slides, gravel, alluvial fans, and lake deposits rich in salts and gypsum derived from sedimentary rocks from the adjacent mountain ranges has been identified.

The Jarilla Mountains are located within the Tularosa Basin, just north of the Fort Bliss boundary. This mountain range is a prominent interior desert range covering approximately 10 miles in a north-south alignment. The east-west width of the range is about 4 miles. Maximum relief is about 1,200 feet and averages about 600 feet. The range possesses steep, rugged hills surrounding the interior valleys, which are bordered by alluvial fans and pediment surfaces. The Jarilla Mountains were formed around 30 million years before the present during the Tertiary Period. Volcanic intrusions of granodiorite and monzonites penetrated the overlying Paleozoic sedimentary rocks in the southern portion of the range. Fringing the southern and eastern sides of the monzonite are upwarped Pennsylvanian carbonate rocks, which have undergone varying degrees of contact metamorphism adjacent to the intrusive. The general structural setting of the range is one of forceful intrusion of the monzonite, particularly in the southern end. In detail, however, the monzonite shows evidence of emplacement by stopping, with numerous dikes and sills filling fractures in adjacent limestone (Beane, Jaramillo, and Bloom,

1975). Sedimentary rocks that crop out in the Jarilla Mountains range in age from the Pennsylvanian to the Permian Age. Rock types include limestone, shale, sandstone, and mudstone. In the northern half of the Jarillas, the sedimentary units dip north-northeast at 20 degrees or less. These units wrap around the eastern flank of the mountains, forming hogback ridges which dip steeply away from the central intrusive core.

The Orogrande mining district was active in the Jarilla Mountains from the 1880's through 1930. Hydrothermal mineralization in the southern Jarilla Mountains consisted of replacement deposits of base metals, with gold in the carbonate rocks adjacent to the intrusives. Total production from the district was valued at \$2.5 million dollars. About half a million dollars was obtained from gold and iron, with the rest being generated from copper and lead. Obtaining water for concentrating the ore was always a problem in this area. The mining district is mostly inactive today.

The Hueco Mountains form the southeastern boundary of Fort Bliss. The Huecos are a relatively low-lying rock mass of steeply dipping beds which stretch from Texas into New Mexico. The range is generally barren and is composed primarily of Paleozoic sedimentary rocks. The major soils found in the Huecos are the limestone-derived Bissett and Altuda series. These soils are very shallow and shallow to limestone and are on hills. Small outcrops of Precambrian red granite are exposed on the southern margin of the mountains. Near the state line, Tertiary alkalic intrusive rocks form Hueco Tanks State Park. Natural rock cisterns which formed in these rocks have been used for centuries by Native Americans and early settlers for a water source (Underwood, 1980).

Lying north of the Hueco Mountains is Otero Mesa. The mesa rests on the southern extension of the ancient buried Pedernal landmass. Late Tertiary tectonism produced the present structural form of the area, primarily through a series of tilted fault blocks which are consecutively less deformed and uplifted to the south and east. These tilted fault blocks are generally outlined by major anticlines and synclines which formed by drape-folding over deep-seated fault blocks that have been gently tilted towards the northeast (Black, 1980). Only Permian rocks of the Hueco Formation with a scattered and thin covering of Quaternary sand and gravel are exposed throughout the area. The major soils found on Otero Mesa are the Jerag, Reyab, and Armesa series. Jerag soils are non-skeletal with a shallow petrocalcic horizon. Reyab soils are very deep and medium textured. Armesa soils are very deep with a shallow calcic horizon. The Hueco Formation consists mostly of limestone, with smaller amounts of shale, siltstone, and sandstone.

Adjacent to the northeastern boundary of the base lies the Sacramento section. This section lies between the Basin and Range physiographic province and the Pecos Valley section of the Great Plains physiographic province. The Sacramento section covers a north-south area 300 miles long and about 70 miles in width. Near Fort Bliss, this section includes the Sacramento Mountains. The Sacramento Mountains are an east tilted, fault block range. The mountains are formed from Paleozoic sedimentary rocks overlying Precambrian granite. The granite outcrops in the

southern Sacramento Mountains near the base of the Sacramento escarpment. The Paleozoic rocks consist of mainly limestone and shale and is very fossiliferous in areas. The major soils found in the southern Sacramento Mountains are the Deama, Penalto, and Cale soils. These soils have mollic epipedons. The Deama and Penalto soils support pinyon and juniper. The Deama soils are very shallow and shallow to limestone. The Penalto soils are shallow to a petrocalcic horizon. The Cale soils are very deep and are found along drainageways in the mountains.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon.

Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

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

Alluvial cone. The material washed down the sides of mountains and hills by ephemeral streams and deposited at the mouth of gorges in the form of a moderately steep, conical mass descending equally in all directions from the point of issue.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo. The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium.

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 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. 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.

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.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

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

Caliche. A 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.

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

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

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer. Very channery soil material has 35 to 60 percent of these rock fragments, and extremely channery soil material has more than 60 percent.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

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 film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

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

Colluvium. 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. See shrub-coppice dune.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cuesta. A hill or ridge that has a gentle slope on one side and a steep slope on the other; specifically, an asymmetric, homoclinal ridge capped by resistant rock layers of slight or moderate dip.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

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

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

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement. 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.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

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

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

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.

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

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

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

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

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. 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.

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

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

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

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

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter. Very gravelly soil material has 35 to 60 percent of these rock fragments, and extremely gravelly soil material has more than 60 percent.

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.

Hard to reclaim (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Head out. To form a flower head.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes

of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and

depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock 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.

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

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time.

Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluv. 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.

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

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

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

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Masses. 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.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

Metamorphic rock. Rock of any origin altered in

mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

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.

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.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills

consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

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

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

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.

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 native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

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

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

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed 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.

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.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

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.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune. A small dune that forms from sandy eolian material deposited around brush and clump vegetation.

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.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

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

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

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

Sodium adsorption ratio (SAR). A measure of the

amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

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.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

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.

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."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

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.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

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.

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Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (<http://directives.sc.egov.usda.gov/33085.wba>).

All Other Inquires

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (<http://directives.sc.egov.usda.gov/33086.wba>).