Supplement to the Soil Survey of White Sands Missile Range, New Mexico

In cooperation with:
- United States Department of Defense, White Sands Missile Range, Holloman Air Force Base and NASA White Sands Test Facility;
National Cooperative Soil Survey

This document 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 has leadership for the Federal part of the National Cooperative Soil Survey.

This supplement accompanies the most current official data for the soil survey of White Sands Missile Range, New Mexico, available at: http://websoilsurvey.nrcs.usda.gov/app/.

Major fieldwork for this soil survey was completed in 2012. Soil names and descriptions were approved in 2012. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2012. This survey was made cooperatively by the United States Department of Agriculture, Natural Resources Conservation Service; the United States Department of Defense, White Sands Missile Range, Holloman Air Force Base and NASA White Sands Test Facility; and the United States Department of the Interior, Fish and Wildlife Service, San Andres National Wildlife Refuge, and National Park Service, White Sands National Monument.

Literature Citation

The correct citation for this survey is as follows:


Cover Caption

West-facing dip slope of San Andres Peak in White Sands Missile Range.

Additional information about the Nation’s natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov/.
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**Formation and Classification of the Soils**

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Issued 2017
Foreword

This document is intended to provide additional information about the survey of White Sands Missile Range, New Mexico, that is not provided in the Web Soil Survey SSURGO data.

This supplement and the online soil survey data provide information that affects land use planning in this survey area. They are intended for many different users. Farmers, ranchers, foresters, and agronomists can use the information to evaluate the potential of the soil and the management needed for maximum food and fiber production. The information can be used by planners, community officials, engineers, developers, builders, and home buyers to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. It can also be used by conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control 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.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS state soil scientist (http://soils.usda.gov/contact/state_offices/).

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Supplement to the
Soil Survey of White Sands
Missile Range, New Mexico

By Greg Cates and David White, Natural Resources Conservation Service

Fieldwork by Greg Cates, David White, James Bauchert, Charles Hibner, Aaron Miller, Gordon Michaud, Austin Eldridge, Justin Riggs, Jennifer Puttere, Jason Nemecek, Charles Ferguson, William Shoup, Alejandro Rey, Scott Zschettzsche, and Jeff Goats, Natural Resources Conservation Service

Ecological site identification and development by David Trujillo and Jason Martin, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with

This document was developed to support and supplement the data for the soil survey of White Sands Missile Range, New Mexico. The data and maps for this soil survey have been previously published for the Soil Survey Geographic Database (SSURGO) via the Web Soil Survey online application. Report tables, interpretations, and maps can be accessed using the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/). Data can be downloaded using the Geospatial Data Gateway (http://datagateway.nrcs.usda.gov/).

This document provides information not available through Web Soil Survey. It contains narrative descriptions of the physiography, geology and geomorphology, wildlife, climate, and formation of the soils in the survey area. In addition, it provides descriptions of the detailed soil map units along with photographs of soil profiles and landscapes.

White Sands Missile Range is located in south-central New Mexico (fig. 1). The survey area covers 2,053,658 acres, or 3,209 square miles, and includes portions of Doña Ana, Lincoln, Otero, Sierra, and Socorro Counties, New Mexico. Fort Bliss Military Reservation borders the survey area to the south. The remaining range is bordered by the Sacramento Mountains to the east, Chupadera Mesa to the north, and the Jornada Del Muerto basin to the west.

This survey is an extensive revision of the soil survey of White Sands Missile Range published in 1976. It updates parts of the surveys of Doña Ana, Lincoln, Otero, Sierra, and Socorro Counties, New Mexico, which were published in 1980, 1983, 1981, 1984, and 1988, respectively. This survey was mapped at a scale of 1:24,000.

The survey area includes portions of two major land resources areas (MLRAs): the Thermic Chihuahuan Desert Basins, Plains and Mountains (MLRA 42) and the Mesic Central New Mexico Highlands (MLRA 70).
Elevations range from approximately 3,894 feet on the Alkali Flat to 8,967 feet on the summit of Salinas Peak.

There are no perennial streams on the missile range. Salt Creek, an intermittent stream, flows southward from the Mockingbird, Little Burro, and Oscura Mountains into Big Salt Lake. The Lost River, also intermittent, on Holloman Air Force Base originates in the Sacramento Mountains to the east and flows into Lake Holloman and on to White Sands National Monument. Other drainage components of detailed map units are ephemeral.

**General Nature of the Survey Area**

This section discusses the history and development, physiography, geology and geomorphology, wildlife habitat, and climate of the survey area.
History and Development

Human inhabitation of the Tularosa Basin can be divided into four periods: the Paleo-Indian (10,000 to 6,000 BC), the Archaic (5,000 BC to AD 200), the Formative (AD 200 to 1,400), and the Historic (AD 1,540 to present).

Paleo-Indian people entered the Tularosa Basin area around 10,000 BC. Evidence found at sites dated between 9,500 and 5,500 BC indicates these people practiced butchering and tool manufacturing. Archaic populations used more diverse resources than earlier inhabitants. Hunting and gathering occurred on a broader spectrum.

During the Formative Period, inhabitants developed ceramics and agriculture and started semi-permanent communities. During the late 1300s, in the southern part of the present-day missile range, large communities of stone and adobe pueblos were developed. During this period, due to higher than normal rainfall, corn and other crops were raised. Many of these villages were abandoned around AD 1400.

In the mid-1400s, Apaches entered the region. By 1540, ancestors of the Mescalero Apache began inhabiting the Tularosa Basin and surrounding mountains while the Chiricahua Apache inhabited the region west of the survey area to the border of Arizona.

Spaniards entered southwestern New Mexico in the late 1500s and established a territorial capital at Santa Fe. After a pueblo revolt, Santa Fe was temporarily abandoned and the people resettled in other areas, including the area of present-day Ciudad de Juarez. After gaining independence from Spain, Mexican citizens travelled through the Rio Grande Valley and settled in the Las Cruces area.

Prior to the Civil War, the U.S. Army built numerous forts along the Rio Grande. During the Civil War, the Confederate Army of Texas captured forts along the Rio Grande along with Albuquerque and Santa Fe. The Confederate Army was defeated at the Battle of Glorieta Pass and retreated to Texas.

The Mescalero Apache Reservation was established in 1873. Afterwards, European and Hispanics began to move into the area in increasing numbers. Copper, silver, and gold mining in the San Andres and San Augustin Mountains started in the mid-1850s. However, the mines were not profitable and eventually abandoned.

Large-scale ranching started in the early 1880s. Ranches were scattered across the survey area until World War II. The large expanse of virtually unoccupied land was attractive to the U.S. Army for military purposes. In 1945, the ranchers were forced to abandon their property when White Sands Proving Grounds was established.

Trinity Site was selected for the first atomic bomb explosion, which occurred on July 16, 1945. Since then, White Sands Missile Range has been one of the major testing grounds for missiles and rockets in the United States.

Physiography

The survey area lies within the Basin and Range physiographic province. The Mexican Highland physiographic section makes up the majority of the survey area. This section extends from the southern border with Fort Bliss military installation northwards, encompassing the Tularosa Basin, the San Agustin and San Andres Mountains, and the northern part of the Jornada Del Muerto. The Sacramento physiographic section is in the north-central and northeastern parts of the survey area and includes the Oscura Mountains and Chupadera Mesa.

The southern part of the survey area between the Fort Bliss border and U.S. Highway 70 is characterized by basin and piedmont landscapes. Wind erosion has formed shrub-coppice dune fields in the majority of this area. Elevations in this area range from about 3,990 to 5,220 feet. There is no external drainage.

North of this area and south of the White Sands dune field are relict lakebeds and stabilized gypsum dunes that formed when southern remnants of the ancient Lake
Otero receded and evaporated. As the water table lowered, precipitated gypsum deposits were scoured out of the lakebeds by southwest-trending winds. The deposits formed lunettes, playa dunes, and other stabilized dune features, generally on the northeast side of the lakebeds. Elevations in this area range from about 3,890 to 4,110 feet.

North of this region is the Alkali Flat, which is thought to be one of the main sources of gypsum sand for the White Sands dune field. During past pluvial events, precipitation in the surrounding mountains dissolved Yeso Formation gypsum in the surrounding mountains. This solution flowed into the lowest parts of the Tularosa Basin into Lake Otero, which extended across the width of the Tularosa Basin during the late Pleistocene (Herrick, 1904; Kottlowski, 1958; Seager et al., 1987; Allen and Love, 2009). Because the Tularosa Basin did not drain into another watershed, all soluble salts deposited in the basin accumulated. When Lake Otero receded and the water table lowered, gypsum precipitates formed. Deflation events from strong southwest-trending winds removed gypsiferous sediments from these lakebeds and reworked and redeposited these sediments into the characteristic barchan and parabolic dune fields seen today. Elevations in this area range from about 3,900 to 4,100 feet.

The western and northern parts of the survey area are composed of the San Agustin, San Andres, and Oscura Mountains and Chupadera Mesa. These mountains formed when compression forces from the Rio Grande Rift formed faults and caused the settling and infilling of what is now the Tularosa Basin. The mountains have a Pre-Cambrian granitic base overlain by sedimentary formations consisting of dolomite, limestone, shale, and gypsum (Kottlowski et al., 1956; Raatz 2002). Regional faulting caused the San Andres Mountains to dip westward and thus expose the vertical sheer cliffs of the scarp slope eastward. The Oscura and Sacramento Mountains dip eastward with a westward view of the escarpments. The San Andres watershed drains westward into the Jornada Del Muerto and eastward into the Tularosa Basin. The Oscuras Mountains drain southeastward into the northeastern part of the Tularosa Basin. Elevations in this area range from about 4,500 to 8,967 feet.

North of the White Sands dune field and south of the Carrizozo lava flow are more semi-active to inactive gypsum dunes and saline drainages. Reddish siliceous sediments from the Oscura and Sacramento Mountains have mixed with gypsum sands and resulted in red soil colors. Intermittent to perennial streams, such as Salt Creek, the Lost River, and Tularosa Creek, drain southward and southeastward into Big Salt Lake and other smaller playas north of the White Sands dune field. Elevations in this area range from about 3,980 to 4,440 feet.

The Carrizozo lava flow is a basalt flow that extends north of Carrizozo and terminates at Malpais Spring on the missile range. This lava flow originated when Little Black Peak erupted approximately 5,000 years ago. Dunbar (1999) estimated the flow is 5,200 years old, plus or minus 700 years. Lava flowed southwest through the Tularosa Valley in two separate events. The flow is 44 miles long, 0.5 mile to 5.5 miles wide, and as much as 160 feet thick. Collapsed lava tubes are common on the lava flow. Several large and small kipukas (areas that the lava flow surrounded but did not cover) are common. Runoff from the Sacramento Mountains flows under the lava flow and emits at Malpais Spring. This spring and Salt Creek are inhabited by pup fish, an endangered species that can survive in highly saline water (Miller and Echelle, 1975). The elevation of this lava flow ranges from about 4,140 to 4,600 feet.

The northwest part of the survey area consists of another enclosed basin that grades into piedmonts and low hills. Pleistocene Lake Trinity filled with gypsiferous sediments and deflated in a manner similar to the Alkali Flat and Lake Lucero but at a lesser scale. Active dunes that may have formed in the past are now stabilized or overlain by siliceous sands from the Jornada Del Muerto or alluvium from the Oscura Mountains. Elevations in this area range from about 4,670 to 5,700 feet.
Geology and Geomorphology

By Steven Lacy, geologist, Natural Resources Conservation Service.

Approximately 40 million years before present, compression and extension forces of the Rio Grande Rift began the development of large faults on both the east and western sides of the present Rio Grande Valley. Extension forces created normal fault systems, which allowed one block to move upward in relation to the adjacent block. As large blocks began to lift and form north-south-trending ranges along this rift valley, the mass of earth lying between these fault blocks dropped. Displacement of up to 2 miles has occurred in some locations. Areas of the dropped blocks have filled with large quantities of alluvial materials from the nearby mountain ranges and from materials transported from the north by the Rio Grande.

Two mountain ranges are found within the military reservation. The largest range is the San Andres Mountains. These mountains generally trend north-northwest to south-southeast and are located along the western edge of the missile range. The Oscura Mountains are along the northern border of the range. The Jornada Del Muerto plains lie to the west of the San Andres Mountains while a large desert bolson, the Tularosa Basin, lies to the east. Other important geologic features in the survey area are the world’s largest gypsum dune field, which was generated from Pleistocene to recent deposits from Lake Otero and Lake Lucero, and the 45-mile-long Carrizozo lava flow.

The San Andres Mountains form the western arm of a collapsed anticline which extends into the Sacramento Mountains. The highest point of the range is Salinas Peak, at 8,967 feet. The mountains dip towards the west with exposures of mainly Pennsylvanian to Permian carbonate and evaporite sequences overlying Precambrian igneous bedrock. These materials were derived from the shallow marine seas that covered New Mexico during the Paleozoic Era (570 to 245 million years before present). The Permian Yeso Formation has large amounts of gypsum which formed as the inland seas began to evaporate. During the period when mountain building forces were generated, the rocks forming the San Andres and Sacramento Mountains arched upward and formed an anticline. The central portion of this anticline eroded and collapsed, which resulted in the formation of the Tularosa Basin. The collapse exposed the gypsum deposits of the Yeso Formation in the mountains to weathering. As the gypsum dissolved and was carried in solution down into the basin, it began to precipitate out in playa lakes lying at the foot of the San Andres Mountains. As the playa lakes periodically dried up, the gypsum reformed into crystals which were weathered into sand-sized particles. Prevailing southwest to northeast winds migrated the gypsum sand to the current dune fields forming White Sands National Monument.

The Oscura Mountains rise about 3,000 feet along the west-facing scarp. They formed from a fault block and consist of Precambrian granite covered by Paleozoic sedimentary rocks that dip eastward. The highest point in the Oscura Mountains is 8,640 feet.

The tectonic events that led to the formation of the Tularosa Basin began around 30 million years before present. The basin began to drop around 10 million years before present. Large crustal blocks subsided several thousands of feet in relation to the surrounding mountains and formed a graben. Erosion began cutting back the exposed faces of the Sacramento and San Andres Mountains and also began removing the higher rocks within the center of the basin. Today, only small remnants of the central ridge—Two Buttes and Tularosa Peak—remain above the nearly flat floor of the basin. Two Buttes is capped with San Andres Limestone overlying the Yeso Formation. Over time, alluvial and colluvial sediments began to fill the basin. These materials are more than 2,000 feet thick along the foot of the mountain ranges and have helped to form the broad, flat valley floor that slopes to the southwest. Because the Tularosa Basin has no external drainage, it is classified as a bolson. All moisture
entering the basin either evaporates or sinks into the alluvial material. During the late Pleistocene, the climate in New Mexico was much cooler and wetter. A large pluvial lake called Lake Otero formed on the basin floor. The lake covered an area of 1,600 square miles and persisted for nearly 20,000 years. When the climate began to warm, around 12,000 years before present, the lake began to evaporate and a dry lakebed (known today as Alkali Flat and Lake Lucero) began to develop. The dry lakebed is the source of the gypsum which forms the dune fields. Lake Lucero still holds water at various times and is the lowest elevation within the basin. The major gypsum dune formation probably occurred around 6,500 to 7,000 years before present. The dune field within the Tularosa Basin covers 275 square miles. Other dune fields formed from quartz sand can be found both north and south of the gypsum dunes. All of the dune fields are aligned by the prevailing southwesterly winds.

The Carrizozo lava flow in the northern and central portions of the Tularosa Basin consists of two separate flows. One flow is approximately 45 miles long, and the other is around 15 miles long. The flows consist of alkaline basalts ranging up to 150 feet in thickness and exhibit features commonly observed in flows from Hawaiian eruptions. The lava features include ropey and pahoehoe textures, collapsed lava tubes, and fissures. The flows originated in the Little Black Peak area. The age of the flows is estimated at around 5,000 years before present.

On the west side of the San Andres Mountains is the geomorphic feature known as the Jornada Del Muerto (Spanish for “Journey of Death”). It was famous for its lack of water and the difficulties it caused for early Spanish colonizers crossing the area north towards Santa Fe. Geologically, this feature appears to be a syncline situated between the Rio Grande Rift faults and the mountain ranges lying to the east. Topographically, this area acts as a basin lying between the Rio Grande and the San Andres Mountains. Alluvial and colluvial materials several thousand feet thick have been deposited in this area. This basin has scattered dune fields at the northern end and the remains of a Pleistocene lake known as Lake Trinity.

**Wildlife Habitat**


Because of the diverse topography, the survey area has diverse microclimates, which provide numerous unique habitats. Elevations range from 1,180 meters (3,871 feet) within the gypsum dune field to 2,733 meters (8,965 feet) on Salinas Peak. The vegetative communities range from Chihuahuan Desert shrub on the basin floor to scattered ponderosa pine on Salinas Peak.

**The Jornada Plain**

The Jornada Plain, located in the northern Jornada del Muerto Basin, covers approximately 141,547 hectares (349,762 acres). Surface waters generally drain into closed basins; a portion of one basin drains westward into the Rio Grande. The center of the Jornada del Muerto Basin is believed to be the Pleistocene Lake Trinity, 200 square kilometers (77 square miles) in area. Topography is mildly undulating to flat; elevations range from 1,414 to 1,930 meters (4,639 to 6,332 feet).

The dominant vegetation is sandsage shrublands and lowland basin grasslands. The alluvial fans on the northwestern face of the San Andres Mountains and the western face of the Oscura Mountains are covered by creosotebush shrublands that are interrupted in places by drainages containing mixed lowland basin grasslands. The lowland basin grasslands terminate at the gypsum outcrop in the center of the basin.

Characteristic wildlife includes desert box turtle, desert grassland whiptail, prairie rattlesnake, aplomado falcon, pronghorn, oryx, yellow-faced pocket gopher, deermouse, kit fox, and hog-nosed skunk.
The Oscura Mountains

The Oscura Mountains cover approximately 71,558 hectares (176,819 acres). Elevations range to 2,650 meters (8,700 feet) on Oscura Peak. The Oscura Mountains contain three distinct mountain ranges: the Little Burro Mountains in the southwest part of the unit, the Oscura Mountains in the center, and Chupadera Mesa in the northeast. The Oscura Mountains have a steep, west-facing escarpment that dips to the east with rolling, dissected uplands (Kottlowski and Steensma, 1979). The northern part of the Oscura Mountains changes orientation and plunges northward (Kottlowski and Steensma, 1979). Chupadera Mesa, an easterly dipping plateau, lies east of the Oscura Mountains.

The Oscura Mountains are dominated by pinyon and juniper woodlands at the higher elevations and by creosotebush shrublands and mixed foothill grasslands in the foothills and bajadas. Interior chaparral forms a band along the western-facing slopes of the Oscura Mountains. The Little Burro Mountains, reaching an elevation of 1,966 meters (6,450 feet), are dominated by mixed foothill piedmont grasslands that transition to creosotebush shrublands and scattered fourwing saltbush at the lower elevations. Lowland desert grasslands occur along the western edge of alluvial fans that empty onto the Jornada Plain.

Characteristic wildlife includes short-tailed lizard, Great Plains skink, black-tailed rattlesnake, red-tailed hawk, common raven, grey vireo, pinyon jay, mule deer, porcupine, gray fox, big brown bat, and Colorado chipmunk.

The Upper Tularosa Basin

The Upper Tularosa Basin covers approximately 210,086 hectares (519,124 acres). Elevations range from 1,187 to 1,399 meters (3,894 to 4,589 feet). Ephemeral drainages dissect the landscape, and there are scattered alkaline and brackish playas. The foothills of the Oscura, Little Burros, and Mockingbird Mountains ring the northern and western edges of the basin. The eastern boundary of the main range is on the east, and the gypsum dunelands are in the southern extent of the basin.

The Upper Tularosa Basin is dominated by shrubland and grassland communities. Because of its size, it has high diversity of vegetative communities, from foothills grasslands to desert shrublands and lowland swales. Creosotebush shrublands cover the lower reaches of the alluvial fans in the surrounding mountain piedmonts and extend into the basin, where they are associated with mixed lowland desert scrub. The mixed lowland desert scrub is characterized by intermixed communities of creosotebush, tarbush, and fourwing saltbush shrublands and includes large areas of creosotebush/tarbush, creosotebush/alkali sacaton, and creosotebush/sparse communities. Fourwing saltbush dominates the more barren alkali flats surrounding the lava flows that transition into the more gypsic soils of the Lake Lucero/Dunes. The lowland basin grasslands are dominated by relatively uniform areas of alkali sacaton and tobosa grass. The grasslands at the eastern end of this area become intermixed with honey mesquite/alkali sacaton communities. Inland saltgrass-alkali sacaton grasslands occur within the wetlands of Malpais Spring.

Characteristic wildlife includes southern prairie lizard, side-blotched lizard, prairie rattlesnake, Harris’s hawk, American avocet, greater roadrunner, eastern meadowlark, scaled quail, Texas antelope, ground squirrel, cactus mouse, desert cottontail, mule deer, oryx, coyote, and badger.

The San Andres Mountains

The San Andres Mountains cover 165,561 hectares (409,101 acres) and encompass the entire San Andres Mountain range, including the Mockingbird Mountains. The San Andres Mountains drain into three closed basins: the Tularosa Basin to the east and the Jornada del Muerto and Jornada Draw to the west. Midway
into the mountains, these basins drain into the Elephant Butte Reservoir basin, which drains into the Rio Grande. The basins isolate the mountains in both directions. The San Andres Mountains were historically a central component of the ecological corridor between the northern Rocky Mountains and the Sierra Madre complex and currently harbor relict Pleistocene elements. The stratigraphy exposed in this range provides clues to the geologic history of the State of New Mexico. Unlike the Sacramento Mountains to the east and the Basin and Range Mountains to the north, the San Andres Mountains are relatively ungrazed and sparsely developed and have few roads. The mountain range provides habitat for large mammals, such as pronghorn, mule deer, and cougar. It also contains habitat considered crucial to the survival of the desert bighorn sheep, listed as endangered in New Mexico. Its precipitous cliffs provide staging and nesting areas for numerous raptors, and the limestone and gypsum outcrops support several endemic plant species. 

Vegetation in the San Andres Mountains is typical of mountain ranges in the Chihuahuan Desert. It varies from stands of ponderosa pine at the highest elevations, to a mosaic of montane grasslands and pinyon pine and juniper woodlands, to strongly edaphic communities of Chihuahuan Desert scrub, and to foothill grasslands and mesquite and creosotebush that characterize the alluvial fans at the lowest elevations. At high-elevation springs and the headwaters of perennial streams, small montane riparian communities gradually transition into arroyo riparian vegetation on the drier alluvial fans.

Characteristic wildlife includes Chihuahuan spotted whiptail, tree lizard, mountain patch snake, mountain bluebird, ladder-backed woodpecker, red-tailed hawk, scaled quail, pinyon mouse, mule deer oryx, desert bighorn, mountain lion, and elk.

The Lake Lucero/Dunes

The Lake Lucero/Dunes cover approximately 193,646 hectares (7,891,499 acres) and contain the largest gypsum dune field in the world, a globally recognized natural feature. Most of the complex of shifting dunes lies within the boundaries of the survey area. Elevations range from 1,180 to 1,875 meters (3,871 to 6,151 feet). The broad range in elevation is due to the inclusion of the bajada of the San Andres Mountains.

The Lake Lucero/Dunes encompass the entire range of the gypsum dune ecosystem. Most of the land south of White Sands National Monument is fragmented by military facilities, WITs (weapon impact targets), and a dense network of roads. In the southern part of the area, the fragmented landscape presents formidable barriers to wildlife and natural ecosystem processes. In some portions, however, very old, indurated gypsum surfaces provide habitat for obligate gypsophiles and animals adapted to the harsh environment.

The vegetation associations within Lake Lucero/Dunes can be stratified according to major landscape components: alluvial fans, alluvial plains, and basin floor. Vegetation transitions from the foothill-piedmont grasslands typical at the higher elevations to the creosotebush shrublands on the alluvial fans and the mesquite shrublands on the alluvial plain. The vegetation associated with the alluvial landforms of the San Andres Mountains occurs along the western edge of the area and comprises only 22 percent of the area. The remaining 78 percent is either barren or dominated by vegetation assemblages tolerant of the gypsum and alkaline substrates of the basin floor. Pickleweed shrubland is the dominant community of the basin floor overlying alkaline flats. Vegetated gypsum duneland communities are dominated by either broom dalea or hoary rosemarymint shrublands. Vegetated gypsum outcrop is characterized by gyp dropseed/hairy coldenia or fourwing saltbush/gyp dropseed communities. Grassland communities, such as gypgrama-New Mexico bluestem, are tolerant of the gypsum substrate and occur within the interdune swales.

Characteristic wildlife includes little striped whiptail, White Sands prairie lizard, killdeer, many species of sandpiper, Ord’s kangaroo rat, and spotted ground squirrel.
The Southern Jornada

The Southern Jornada, which includes the western flank of the southern San Andres Mountains, covers 33,297 hectares (82,276 acres). Elevations range from approximately 1,360 to 1,583 meters (4,462 to 5,193 feet). The Southern Jornada is representative of an ecosystem concept that associates the physiographic features of the alluvial fans with the basin floor rather than with the piedmont. The commonly deeply incised fans provide a suitable environment for plant communities to gradually spread onto the fans. Many of the vegetative communities representative of alluvial plains are within the drainages and on the lower fans. This area is important because it contains evidence of the rich cultural history of the Jornada Mogollon.

The dominant vegetation is mesquite shrubland, mixed lowland desert shrub, and creosotebush shrubland. Lowland basin grasslands are scattered throughout coppice dunes in the middle to upper section of this area, and sand sheets occupy most of the basin. Foothill piedmont desert grasslands, which comprise a very minor part of this area, occur on the hills and mountains along the eastern edge of the area.

Characteristic wildlife includes desert box turtle, long-nosed leopard lizard, New Mexico whiptail, Texas horned lizard, diamondback rattlesnake, Harris’s hawk, Gambel’s quail, greater roadrunner, spotted squirrel, desert pocket gopher, oryx, coyote, bobcat, black-tailed jackrabbit, and javalina.

The Lower Tularosa Basin

The Lower Tularosa Basin covers 70,344 hectares (173,820 acres). The Main Post is located in the southwestern corner of the main range. With the exception of a small portion of the eastern flank of the Organ Mountains, basin features typical of the Chihuahuan Desert dominate this landscape. The expansive eolian deposits are the northern part of an extensive complex of shifting to stabilized sand sheets and dune fields that continue to the south. The composition of these dune fields differs greatly from the lacustrine- and gypsum-dominated sands that occur to the north. Activities in this area are diverse and include housing for WSMR personnel, WSMR administration facilities, tenant facilities, and launch and test facilities. This area contains more roads and disturbed land per unit area than any other.

Basin shrublands dominate this area and are part of a broad, extensive dune field of mesquite coppice dunes that extend south into Texas and Chihuahua, Mexico.

Characteristic wildlife includes desert box turtle, long-nosed leopard lizard, New Mexico whiptail, Texas horned lizard, diamondback rattlesnake, Harris’s hawk, Gambel’s quail, greater roadrunner, spotted squirrel, desert pocket gopher, oryx, coyote, bobcat, black-tailed jackrabbit, and javalina.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Tularosa, New Mexico, in the period 1971 to 2000. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 43.7 degrees F and the average daily minimum temperature is 29.6 degrees. The lowest temperature on record, which occurred at Tularosa on November 29, 1976, is 0 degrees. In summer, the average temperature is 77.1 degrees and the average daily maximum temperature is 92.2 degrees. The highest temperature, which occurred at Tularosa on June 26, 1994, is 110 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
**Table 1.**—Temperature and Precipitation  
(Recorded in the period 1971-2000 at Tularosa, New Mexico)

<table>
<thead>
<tr>
<th>Month</th>
<th>Temperature (degrees F)</th>
<th>Precipitation (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 years in 10 will have--</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>daily</td>
<td>daily</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
<td>Minimum</td>
</tr>
<tr>
<td></td>
<td>higher</td>
<td>lower</td>
</tr>
<tr>
<td>January--</td>
<td>56.6</td>
<td>28.1</td>
</tr>
<tr>
<td>February-</td>
<td>61.6</td>
<td>32.2</td>
</tr>
<tr>
<td>March----</td>
<td>68.9</td>
<td>37.2</td>
</tr>
<tr>
<td>April----</td>
<td>76.2</td>
<td>43.4</td>
</tr>
<tr>
<td>May------</td>
<td>84.2</td>
<td>52.1</td>
</tr>
<tr>
<td>June-----</td>
<td>92.9</td>
<td>59.9</td>
</tr>
<tr>
<td>July------</td>
<td>92.9</td>
<td>63.6</td>
</tr>
<tr>
<td>August----</td>
<td>90.7</td>
<td>62.4</td>
</tr>
<tr>
<td>September</td>
<td>85.2</td>
<td>56.4</td>
</tr>
<tr>
<td>October--</td>
<td>75.9</td>
<td>46.1</td>
</tr>
<tr>
<td>November-</td>
<td>63.7</td>
<td>35.2</td>
</tr>
<tr>
<td>December-</td>
<td>55.5</td>
<td>28.6</td>
</tr>
<tr>
<td>Yearly:</td>
<td>75.4</td>
<td>45.4</td>
</tr>
</tbody>
</table>

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).
Table 2.—Freeze Dates in Spring and Fall
(Recorded in the period 1971-2000 at Tularosa, New Mexico)

<table>
<thead>
<tr>
<th>Probability</th>
<th>Temperature (degrees F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 or lower</td>
</tr>
<tr>
<td>Last freezing</td>
<td></td>
</tr>
<tr>
<td>temperature</td>
<td></td>
</tr>
<tr>
<td>in spring:</td>
<td></td>
</tr>
<tr>
<td>1 year in 10</td>
<td></td>
</tr>
<tr>
<td>later than--</td>
<td></td>
</tr>
<tr>
<td>Mar. 29</td>
<td>Apr. 18</td>
</tr>
<tr>
<td>2 years in 10</td>
<td></td>
</tr>
<tr>
<td>later than--</td>
<td></td>
</tr>
<tr>
<td>Mar. 20</td>
<td>Apr. 10</td>
</tr>
<tr>
<td>5 years in 10</td>
<td></td>
</tr>
<tr>
<td>later than--</td>
<td></td>
</tr>
<tr>
<td>Mar. 2</td>
<td>Mar. 26</td>
</tr>
<tr>
<td>First freezing</td>
<td></td>
</tr>
<tr>
<td>temperature</td>
<td></td>
</tr>
<tr>
<td>in fall:</td>
<td></td>
</tr>
<tr>
<td>1 year in 10</td>
<td></td>
</tr>
<tr>
<td>earlier than--</td>
<td></td>
</tr>
<tr>
<td>Nov. 7</td>
<td>Oct. 27</td>
</tr>
<tr>
<td>2 years in 10</td>
<td></td>
</tr>
<tr>
<td>earlier than--</td>
<td></td>
</tr>
<tr>
<td>Nov. 13</td>
<td>Nov. 1</td>
</tr>
<tr>
<td>5 years in 10</td>
<td></td>
</tr>
<tr>
<td>earlier than--</td>
<td></td>
</tr>
<tr>
<td>Nov. 22</td>
<td>Nov. 10</td>
</tr>
</tbody>
</table>

Table 3.—Growing Season
(Recorded in the period 1971-2000 at Tularosa, New Mexico)

<table>
<thead>
<tr>
<th>Probability</th>
<th>Daily minimum temperature (degrees F) during growing season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Higher than 24</td>
</tr>
<tr>
<td></td>
<td>Days</td>
</tr>
<tr>
<td>9 years in 10</td>
<td>226</td>
</tr>
<tr>
<td>8 years in 10</td>
<td>238</td>
</tr>
<tr>
<td>5 years in 10</td>
<td>262</td>
</tr>
<tr>
<td>2 years in 10</td>
<td>286</td>
</tr>
<tr>
<td>1 year in 10</td>
<td>298</td>
</tr>
</tbody>
</table>
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.

The average annual total precipitation is 11.39 inches. Of this, 8.34 inches, or about 73 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 2.36 inches, recorded at Tularosa on September 13, 2001. Thunderstorms occur on about 42 days each year, and most occur in August.

The average seasonal snowfall is 1.5 inches. The greatest snow depth at any one time during the period of record was 6 inches, recorded on November 28, 1976. On an average, no days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 5 inches, recorded in January 1958.

The average relative humidity in mid-afternoon is about 28 percent. Humidity is higher at night, and the average at dawn is about 58 percent. The sun shines 80 percent of the time in summer and 72 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 10.5 miles per hour, in April.

How This Survey Was Made

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

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

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

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

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

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

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

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

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

Survey Procedures

The general procedures followed in making this survey are described in the “National Soil Survey Handbook” (USDA-NRCS) and the “Soil Survey Manual” (Soil Survey Division Staff, 1993). References used include five published soil surveys (those for Otero, Doña Ana, Sierra, Socorro, and Lincoln Counties, New Mexico); the geology map of the east half of Las Cruces and northeast El Paso (Seager et al., 1987); and the geologic map of New Mexico (Scholle, 2003).

This soil survey is an update for portions of Otero, Doña Ana, Sierra, Socorro, and Lincoln Counties, New Mexico. The previous soil surveys were mapped at scales ranging from 1:24,000 to 1:63,360. Some of the established soil series used in these adjoining surveys were used for the soil survey of White Sands Missile Range. The five previous soil surveys were used as a preliminary reference for soil map units and soil series.

Before fieldwork began, preliminary boundaries of slopes and landforms were digitized using 3D analyst and spatial analyst tools from Arc GIS 9.1 on aerial photography at a 1:24,000 scale taken in 2003. 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 land was traversed by foot or ATV.

Sample areas were selected to represent the major landscapes of White Sands Missile Range. Extensive notes were taken on the composition of map units in these preliminary study areas. As mapping progressed, these preliminary notes were modified and final assessments of the composition of the individual map units were made.

As traverses were made, 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 the very steep backslope of a ridge. In most areas, soil examinations along the traverses were made from 50 to 500 feet apart, depending on the landscape and the soil pattern.

Observations of such items as landform, arroyo banks, vegetation, animal burrows, road cuts, 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 spade to a depth of about 6 feet or bedrock. The pedons described as typical were observed and studied in pits that were dug with shovels, spades, or backhoes.
The map units delineated on the detailed soil maps 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 maps 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. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

A soil series family has properties that are slightly outside the official series range but is in the same taxonomic classification as the official series. An example is the

Detailed Soil Map Units
Eppenauer family soils, which are classified as fine-loamy, mixed, superactive, thermic Aridic Arugiustolls.

*Taxadjuncts* are soils that have properties outside the range of any recognized series. They are given the name of an established series that is most similar in characteristics. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named. The differences in properties are so small that the major interpretations are not affected. An example is the Reeves soils.

The soils of a given 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, Aguena sand, 0 to 80 percent slopes, is a phase of the Aquena series.

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

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. Astrobee-Lark-Nasa complex, 0 to 20 percent slopes, is an example.

An *association* consists of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Hembrillo-Shot association, 0 to 15 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The Riverwash component in Marconi-Prelo-Riverwash complex, 0 to 8 percent slopes, is an example.

The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

1—Adelino-Cave complex, 1 to 15 percent slopes

**Map Unit Setting**

*Landform(s):* Fan remnants  
*Elevation:* 4,470 to 5,060 feet (1,363 to 1,542 meters)  
*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)  
*Mean annual air temperature:* 64 to 70 degrees F (18.0 to 21.0 degrees C)  
*Mean annual soil temperature:* 66 to 72 degrees F (19.1 to 22.1 degrees C)  
*Frost-free period:* 180 to 240 days  
*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains  
*Land Resource Unit:* 42-2 Chihuahuan Desert Shrub

**Map Unit Composition**

Adelino and similar soils: 53 percent  
Cave and similar soils: 35 percent  
Minor components: 12 percent  
  Copia and similar soils  
  Tonuco and similar soils  
  Turney soils that have a deep petrocalcic horizon
Petrocalcids that have a petrocalcic horizon exposed at the surface due severe wind erosion, and similar soils
Gullied land

**Description of the Adelino Soil**

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

*Geomorphic position:* Toeslopes and footslopes of fan remnants

*Parent material:* Sandy eolian deposits over alluvium

*Slope:* 1 to 5 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—35 percent
  - woody debris—5 percent
  - bare soil—65 percent
  - rock fragments—0 percent

*Depth to restrictive feature(s):* Unspecified

**Drainage class:** Well drained

*\( K_{sat} \) (solum):* 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

*\( K_{sat} \) (restrictive layer):* Unspecified

*Available water capacity (total inches):* 9.7 (high)

*Shrink-swell potential:* About 3.5 LEP (moderate)

*Flooding hazard:* Rare

*Ponding hazard:* None

*Depth to seasonal high water table (minimum):* Unspecified

**Runoff class:** Low

**Hydrologic group:** C

*Ecological site name:* Loamy

*Ecological site number:* R042XB014NM

*Present vegetation:* American tarbush, creosotebush, and honey mesquite

*Land capability classification (nonirrigated areas):* 7c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 32 degrees 40 minutes 4.30 seconds N. and long. 106 degrees 40 minutes 9.90 seconds W.

**A—0 to 4 inches (0 to 10 centimeters);** light brown (7.5YR 6/4) fine sandy loam,
  - brown (7.5YR 5/4) moist; 10 percent clay; weak fine granular structure; soft, very friable, nonsticky, nonplastic; finely disseminated carbonate throughout; strongly effervescent, 5 percent calcium carbonate equivalent and 0 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 1.4 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

**Bw1—4 to 29.5 inches (10 to 75 centimeters);** brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 22 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout and common fine irregular carbonate masses throughout; 3 percent gravel; strongly effervescent, 7 percent
calcium carbonate equivalent and 0 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw2—29.5 to 60 inches (75 to 152 centimeters); brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; 28 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few fine dendritic tubular pores; finely disseminated carbonate throughout and common fine irregular carbonate masses throughout; 2 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent and 0 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 1.8 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 18 to 35 percent

**A horizon:**
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, loam, or silt loam
- Clay content—5 to 25 percent
- Calcium carbonate equivalent—0 to 5 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

**Bw horizons:**
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—loam, silt loam, or sandy clay loam
- Clay content—18 to 35 percent
- Calcium carbonate equivalent—5 to 10 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

**Diagnostic Features**

- Ochric epipedon—the zone from 0 to 4 inches (A horizon)
- Cambic horizon—the zone from 4 to 60 inches (Bw1 and Bw2 horizons)

**Description of the Cave Soil**

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

*Geomorphic position:* Summits and shoulders of fan remnants

*Parent material:* Alluvium

*Slope:* 1 to 15 percent

*Surface cover*

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—30 percent
woody debris—10 percent
bare soil—70 percent
rock fragments—5 percent gravel

Depth to restrictive feature(s): 6 to 15.5 inches to petrocalcic horizon
Drainage class: Well drained

\( K_{sat} \) (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

\( K_{sat} \) (restrictive layer): 0.00 to 1.98 inches per hour (0.00 to 14.00 micrometers per second)

Available water capacity (total inches): 2.3 (very low)
Shrink-swell potential: About 2.8 LEP (low)
Flooding hazard: None
Ponding hazard: None

Depth to seasonal high water table (minimum): Unspecified
Runoff class: Medium

Hydrologic group: D

Ecological site name: Shallow Sandy
Ecological site number: R042XB015NM

Present vegetation: Creosote bush and honey mesquite

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 40 minutes 35.30 seconds N. and long. 106 degrees 37 minutes 50.90 seconds W.

A—0 to 2 inches (0 to 5 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 20 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent gravel; strongly effervescent, 5 percent calcium carbonate equivalent and 0 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 1.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw—2 to 14 inches (5 to 36 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 24 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout and common fine irregular carbonate masses throughout; 5 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent and 0 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 1.6 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bkkm—14 inches (36 centimeters); light gray (10YR 7/2) indurated material, light brownish gray (10YR 6/2) moist; violently effervescent, 18 percent calcium carbonate equivalent and 0 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 2.1 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics
Clay content of control section (weighted average): 18 to 35 percent
Rock fragment content in control section: 5 to 35 percent
Other characteristics: Some pedons have a Ck horizon below the Bkkm horizon

A horizon:
Hue—7.5YR or 10YR
Value—3 to 5 dry; 4 to 6 moist
Chroma—3 to 4, dry or moist
Texture—loamy sand, sandy loam, fine sandy loam, or loam
Clay content—5 to 25 percent
Rock fragment content—5 to 15 percent
Calcium carbonate equivalent—2 to 10 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline or very slightly saline

Bw horizon:
Hue—5YR or 7.5YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—3 to 4, dry or moist
Texture—loam, sandy clay loam, or clay loam
Clay content—18 to 35 percent
Rock fragment content—5 to 35 percent
Calcium carbonate equivalent—5 to 10 percent
Salinity—nonsaline or very slightly saline

Bkkm horizon:
Cemented material—calcium carbonate
Hardness—strongly cemented to indurated
Thickness—20 to 50 inches; laterally continuous

Diagnostic Features
• Ochric epipedon—the zone from 0 to 2 inches (A horizon)
• Cambic horizon—the zone from 2 to 14 inches (Bw horizon)
• Petrocalcic horizon—the zone from 12 to 22 inches (Bkkm horizon)

2—Aerobee-Slickcity complex, 0 to 5 percent slopes

Map Unit Setting
Landform(s): Alluvial flats (fig. 2)
Elevation: 3,950 to 4,490 feet (1,204 to 1,369 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition
Aerobee and similar soils: 50 percent
Slickcity and similar soils: 46 percent
Minor components: 4 percent
- Gypsic Haplosalids and similar soils
- Hembrillo and similar soils
- Nasa and similar soils
- Yesum and similar soils

Description of the Aerobee Soil
Taxonomic classification: Fine-loamy, gypsic, thermic Leptic Haplogypsids
Geomorphic position: Alluvial flats
Parent material: Fine-loamy alluvium
Slope: 0 to 5 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
moss—0 percent
  cryptogamic crust—10 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—35 percent
  woody debris—20 percent
  bare soil—50 percent
  rock fragments—0 percent
*

Drainage class: Well drained

* K\text{sat} (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity (total inches): 12.0 (very high)

Shrink-swell potential: About 3.8 LEP (moderate)

Flooding hazard: None

Runoff class: Negligible

Hydrologic group: C

Ecological site name: Loamy

Ecological site number: R042XB014NM

Present vegetation: Alkali sacaton, fourwing saltbush, and honey mesquite

Land capability classification (nonirrigated areas): 7c

**Typical Pedon**

* Location by Geographic Coordinate System: lat. 33 degrees 15 minutes 19.10 seconds N. and long. 106 degrees 17 minutes 16.40 seconds W.

Ay—0 to 6.5 inches (0 to 16 centimeters); light brown (7.5YR 6/3) sandy clay loam, brown (7.5YR 4/4) moist; 22 percent clay; moderate very thin platy structure; slightly hard, friable, nonsticky, slightly plastic; common very fine and fine roots throughout; many medium and common fine and coarse tubular pores; finely

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Figure 2.—An area of map unit 2 (Aerobee-Slickcity complex, 0 to 5 percent slopes).
disseminated carbonate and gypsum throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 5 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.

By1—6.5 to 15.5 inches (16 to 40 centimeters); brown (7.5YR 5/3) clay loam, brown (7.5YR 4/4) moist; 30 percent clay; weak medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; many very fine and common fine roots throughout; common fine tubular pores; finely disseminated carbonate and common fine spherical gypsum crystal clusters throughout; violently effervescent, 7 percent calcium carbonate equivalent and 7 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 4.5 dS/m (mmhos/cm); slightly saline; diffuse wavy boundary.

By2—15.5 to 35.5 inches (40 to 90 centimeters); brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/3) moist; 24 percent clay; moderate coarse subangular blocky structure; hard, firm, slightly sticky, moderately plastic; common very fine and fine roots throughout; many fine tubular pores; finely disseminated carbonate, many fine irregular gypsum crystals, and common medium irregular gypsum masses throughout; violently effervescent, 6 percent calcium carbonate equivalent and 8 percent gypsum; slightly alkaline, pH 7.5; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline; gradual wavy boundary.

By3—35.5 to 43.5 inches (90 to 110 centimeters); brown (7.5YR 5/3) gypsiferous sandy clay loam, brown (7.5YR 4/3) moist; 26 percent clay; moderate medium and coarse subangular blocky structure; hard, firm, slightly sticky, moderately plastic; common fine, medium, and coarse roots throughout; common medium tubular pores; finely disseminated carbonate, many fine irregular gypsum crystals, and common medium irregular gypsum masses throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 26 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 7.9 dS/m (mmhos/cm); slightly saline; gradual wavy boundary.

Byz—43.5 to 57 inches (110 to 145 centimeters); brown (7.5YR 5/3) gypsiferous sandy clay loam, brown (7.5YR 4/4) moist; 21 percent clay; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common medium roots throughout; common medium tubular pores; finely disseminated carbonate, many fine irregular gypsum crystals, and many medium irregular gypsum masses throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 28 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 8.7 dS/m (mmhos/cm); moderately saline; gradual wavy boundary.

Bkyz—57 to 71 inches (145 to 180 centimeters); pink (7.5YR 7/3) gypsiferous sandy clay, light brown (7.5YR 6/3) moist; 42 percent clay; moderate medium subangular blocky structure; hard, firm, slightly sticky, moderately plastic; common fine roots throughout; common very fine tubular pores; finely disseminated carbonate, common medium irregular gypsum masses, and common medium irregular carbonate masses throughout; violently effervescent, 12 percent calcium carbonate equivalent and 32 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 10.1 dS/m (mmhos/cm); moderately saline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 18 to 42 percent

**Ay horizon:**
- Hue—5YR or 7.5YR
- Value—6 to 7 dry; 3 to 5 moist
- Chroma—2 to 5, dry or moist
- Texture—loam, sandy clay loam, clay loam, or silt loam
Clay content—15 to 30 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline or very slightly saline

By, Byz, and Bkyz horizons:
Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—2 to 6, dry or moist
Texture—gypsiferous sandy clay loam, sandy clay loam, gypsiferous loam, gypsiferous clay loam, clay loam, gypsiferous silt loam, gypsiferous silty clay loam, or gypsiferous sandy clay
Clay content—18 to 42 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline or moderately saline
Gypsum content—7 to 32 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 6.5 inches (Ay horizon)
• Gypsic horizon—the zone from 6.5 to 71 inches (By1, By2, By3, Byz, and Bkyz horizons)

Description of the Slickcity Soil

Taxonomic classification: Loamy over coarse-gypseous, mixed over hypergypsic, superactive, thermic Typic Haplogypsids
Geomorphic position: Alluvial flats
Parent material: Fine-loamy alluvium over coarse gypseous lacustrine deposits
Slope: 0 to 5 percent
Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—10 percent
Chemical crust:
salt—0 percent
gypsum—0 percent
Physical cover:
canopy plant cover—40 percent
woody debris—20 percent
bare soil—45 percent
rock fragments—0 percent

Depth to restrictive feature(s): 16 to 20 inches to strongly contrasting textural stratification

Drainage class: Well drained
\(K_{sat} \text{ (solum)}\): 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)
Available water capacity (total inches): 3.1 (low)
Shrink-swell potential: About 4.2 LEP (moderate)
Flooding hazard: None
Runoff class: Negligible
Hydrologic group: C
Ecological site name: Gyp Upland
Ecological site number: R042XB006NM
Present vegetation: Alkali sacaton, fourwing saltbush, and Torrey’s jointfir
Land capability classification (nonirrigated areas): 7c
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

Figure 3.—Representative profile of the Slickcity soil in map unit 2 (Aerobee-Slickcity complex, 0 to 5 percent slopes). Scale is in centimeters.

Typical Pedon (fig. 3)

Location by Geographic Coordinate System: lat. 33 degrees 15 minutes 20.70 seconds N. and long. 106 degrees 17 minutes 18.10 seconds W.
Aky—0 to 8 inches (0 to 20 centimeters); light brown (7.5YR 6/3) silty clay loam, brown (7.5YR 4/3) moist; 30 percent clay; moderate very thick platy over moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots throughout; common fine tubular pores; common fine irregular carbonate masses throughout; strongly effervescent, 6 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bky—8 to 17.5 inches (20 to 45 centimeters); reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; 25 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine, fine, medium, and coarse roots throughout; common fine and coarse tubular pores; common fine irregular gypsum crystals and few fine irregular carbonate masses throughout; strongly effervescent, 16 percent calcium carbonate equivalent and 3 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

2Byy1—17.5 to 31.5 inches (45 to 80 centimeters); light reddish brown (5YR 6/3) gypsiferous sandy loam, reddish brown (5YR 5/3) moist; 13 percent clay; moderate medium subangular blocky structure; hard, firm, nonsticky, nonplastic; few very coarse and common very fine roots throughout; few fine tubular pores; finely disseminated carbonate, many fine irregular gypsum crystals, and common fine irregular gypsum crystal clusters throughout; strongly effervescent, 6 percent calcium carbonate equivalent and 46 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 1.8 dS/m (mmhos/cm); nonsaline; diffuse wavy boundary.

2Byy2—31.5 to 47 inches (80 to 120 centimeters); light reddish brown (5YR 6/3) gypsiferous sandy loam, reddish brown (5YR 5/3) moist; 13 percent clay; moderate medium subangular blocky structure; hard, firm, nonsticky, nonplastic; common coarse roots throughout; finely disseminated carbonate, many fine irregular gypsum crystals, and common fine irregular gypsum crystal clusters throughout; strongly effervescent, 6 percent calcium carbonate equivalent and 41 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.6 dS/m (mmhos/cm); very slightly saline; diffuse wavy boundary.

2Byy3—47 to 60 inches (120 to 152 centimeters); light reddish brown (5YR 6/3) gypsiferous sandy loam, reddish brown (5YR 4/4) moist; 13 percent clay; weak medium subangular blocky structure; hard, firm, nonsticky, nonplastic; common coarse roots throughout; common fine irregular gypsum crystal clusters and many fine and medium irregular gypsum crystals throughout; 5 percent gravel; noneffervescent, 27 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 5.4 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 10 to 30 percent

Ay horizon:
Hue—5YR, 7.5YR, or 10YR
Value—5 to 6 dry; 4 to 5 moist
Chroma—3 to 4, dry or moist
Texture—sandy loam, sandy clay loam, loam, or silty clay loam
Clay content—15 to 35 percent
Salinity—nonsaline or very slightly saline
Gypsum content—1 to 5 percent

Bky horizon:
Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—2 to 6, dry or moist
Texture—sandy loam, sandy clay loam, or loam
Clay content—15 to 35 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline to slightly saline
Gypsum content—3 to 10 percent

2Byy horizons:
Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—2 to 4, dry or moist
Texture—gypsiferous sandy loam or gypsiferous loam
Clay content—10 to 18 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline to moderately saline
Gypsum content—25 to 55 percent; average of more than 40 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 7 inches (Aky horizon)
• Gypsic horizon—the zone from 8 to 60 inches (Bky, 2Byy1, 2Byy2, and 2Byy3 horizons)
• Depth to strongly contrasting particle-size class—17.5 inches (loamy over coarse-gypseous)

3—Aguena sand, 0 to 80 percent slopes

Map Unit Setting

Landform(s): Dunes (fig. 4)
Elevation: 5,040 to 5,800 feet (1,536 to 1,768 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 61 to 64 degrees F (16.0 to 18.0 degrees C)
Mean annual soil temperature: 63 to 66 degrees F (17.1 to 19.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-3 Chihuahuan Desert Grassland

Map Unit Composition
Aguena and similar soils: 95 percent
Minor components: 5 percent
  Aguena, moderately deep and similar soils
  Bissett and similar soils

Description of the Aguena Soil

Taxonomic classification: Mixed, thermic Ustic Torripsamments
Geomorphic position: Isolated climbing dunes that typically occur on the lower third of limestone mountains but can occur near the shoulders and summits
Parent material: Eolian sands
Slope: 0 to 80 percent
Surface cover
  Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
  cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—30 percent
  woody debris—5 percent
  bare soil—65 percent
  rock fragments—5 percent gravel

Drainage class: Excessively drained
$K_{sat}$ (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)
Available water capacity (total inches): 4.2 (low)
Shrink-swell potential: About 0.1 LEP (low)
Flooding hazard: None
Runoff class: Very low
Hydrologic group: A
Ecological site name: Sandhills
Ecological site number: R042XC022NM
Present vegetation: Threeawn, Colorado pinyon, honey mesquite, juniper, mountain mahogany, ocotillo, and soaptree yucca
Land capability classification (nonirrigated areas): 6c

**Typical Pedon**

Location by Geographic Coordinate System: lat. 32 degrees 45 minutes 52.80 seconds N. and long. 106 degrees 35 minutes 10.90 seconds W.
C1—0 to 24 inches (0 to 61 centimeters); light reddish brown (5YR 6/4) sand, yellowish red (5YR 4/6) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine and medium roots throughout; many fine interstitial pores; 2 percent gravel; noneffervescent; slightly alkaline, pH 7.7; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

C2—24 to 60 inches (61 to 152 centimeters); yellowish red (5YR 5/6) sand, yellowish red (5YR 5/8) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine and medium roots throughout; many fine interstitial pores; 3 percent gravel; noneffervescent; slightly alkaline, pH 7.7; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 2 to 4 percent

C horizons:
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 8, dry or moist
- Texture—sand, loamy sand, fine sand, very fine sand, or loamy fine sand
- Clay content—0 to 6 percent
- Rock fragment content—0 to 5 percent

4—Agustin-Vado-Riverwash complex, 1 to 10 percent slopes

Map Unit Setting

Landform(s): Channels and fan piedmonts
Elevation: 3,940 to 5,260 feet (1,200 to 1,602 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Agustin and similar soils: 57 percent
Vado and similar soils: 21 percent
Riverwash: 17 percent
Minor components: 5 percent
- Copia and similar soils
- Mimbres and similar soils
- Stagecoach and similar soils

Description of the Agustin Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic Haplocambids
Geomorphic position: Concave positions of the fan piedmont between higher-lying convex areas
Parent material: Gravelly alluvium
Slope: 1 to 10 percent
Surface cover
- Biological crust:
  cyanobacteria—0 percent
lichens—0 percent
moss—0 percent
cryptogamic crust—0 percent
Chemical crust:
salt—0 percent
gypsum—0 percent
Physical cover:
  canopy plant cover—30 percent
  woody debris—5 percent
  bare soil—55 percent
  rock fragments—37 percent gravel
Drainage class: Somewhat excessively drained
$K_{sot}$ (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)
Available water capacity (total inches): 4.8 (low)
Shrink-swell potential: About 0.8 LEP (low)
Flooding hazard: Rare
Runoff class: Very low
Hydrologic group: A
Ecological site name: Gravelly
Ecological site number: R042XB010NM
Present vegetation: Honey mesquite, soaptree yucca, and broom snakeweed
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 41 minutes 31.40 seconds N. and long. 106 degrees 28 minutes 11.40 seconds W.

A—0 to 4 inches (0 to 10 centimeters); dark brown (7.5YR 3/4) coarse sandy loam,
dark brown (7.5YR 3/2) moist; 4 percent clay; weak medium subangular blocky
structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few
very fine dendritic tubular pores; finely disseminated carbonate throughout; 4
percent gravel; slightly effervescent, 4 percent calcium carbonate equivalent;
moderately alkaline, pH 8.1; electrical conductivity of 0.1 dS/m (mmhos/cm);
nonsaline; gradual wavy boundary.

Bw1—4 to 16 inches (10 to 41 centimeters); dark brown (7.5YR 3/4) coarse sandy
loam, dark brown (7.5YR 3/2) moist; 7 percent clay; weak fine subangular blocky
structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout;
common fine dendritic tubular pores; finely disseminated carbonate throughout; 10
percent gravel; slightly effervescent, 3 percent calcium carbonate equivalent;
slightly alkaline, pH 7.8; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline;
gradual wavy boundary.

Bw2—16 to 30 inches (41 to 76 centimeters); brown (7.5YR 5/4) coarse sandy
loam, brown (7.5YR 4/2) moist; 9 percent clay; weak medium subangular blocky
structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few
fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent
gravel; slightly effervescent, 3 percent calcium carbonate equivalent; moderately
alkaline, pH 8.0; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline;
gradual wavy boundary.

C1—30 to 50 inches (76 to 127 centimeters); brown (7.5YR 5/4) cobbly coarse sand,
brown (7.5YR 4/2) moist; 3 percent clay; single grain; loose, loose, nonsticky,
nonplastic; few fine roots throughout; common medium and few fine dendritic
 tubular pores; finely disseminated carbonate throughout; 27 percent cobbles;
slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline,
pH 8.1; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.
C2—50 to 60 inches (127 to 152 centimeters); dark brown (7.5YR 3/4) coarse sand, dark brown (7.5YR 3/2) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine dendritic tubular pores; finely disseminated carbonate throughout; 4 percent gravel; slightly effervescent, 3 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 3 to 18 percent

**A horizon:**
- Hue—7.5YR or 10YR
- Value—3 to 6 dry; 3 to 5 moist
- Chroma—2 to 6, dry or moist
- Texture—loamy coarse sand, coarse sandy loam, or sandy loam
- Clay content—3 to 18 percent
- Reaction—slightly alkaline or moderately alkaline

**Bw horizons:**
- Hue—7.5YR or 10YR
- Value—3 to 6 dry; 3 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—coarse sandy loam or sandy loam
- Clay content—7 to 18 percent
- Reaction—slightly alkaline or moderately alkaline

**C horizons:**
- Hue—7.5YR or 10YR
- Value—3 to 6 dry; 3 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—coarse sand, sand, loamy coarse sand, or loamy sand
- Clay content—0 to 5 percent
- Reaction—slightly alkaline or moderately alkaline

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
- Cambic horizon—the zone from 4 to 30 inches (Bw1 and Bw2 horizons)

**Description of the Vado Soil**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Typic Haplocambids

*Geomorphologic position:* Treads between drainages

*Parent material:* Gravelly alluvium

*Slope:* 1 to 10 percent

*Surface cover*
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

*Physical cover:
- canopy plant cover—35 percent
- woody debris—5 percent
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bare soil—40 percent
rock fragments—37 percent gravel, 3 percent cobbles, and 1 percent stones

**Drainage class:** Somewhat excessively drained

**$K_{sat}$ (solum):** 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

**Available water capacity (total inches):** 4.2 (low)

**Shrink-swell potential:** About 0.6 LEP (low)

**Flooding hazard:** Rare

**Runoff class:** Very low

**Hydrologic group:** A

**Ecological site name:** Gravelly

**Ecological site number:** R042XB010NM

**Present vegetation:** Bush muhly, creosote bush, and honey mesquite

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 32 degrees 40 minutes 42.20 seconds N. and long. 106 degrees 28 minutes 11.60 seconds W.

**A**—0 to 3 inches (0 to 7 centimeters); brown (7.5YR 5/3) very gravelly sandy loam, brown (7.5YR 4/3) moist; 11 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine dendritic tubular pores; finely disseminated carbonate throughout; 38 percent gravel and 2 percent cobbles; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

**Bw1**—3 to 21.5 inches (7 to 55 centimeters); brown (7.5YR 5/3) very gravelly sandy loam, brown (7.5YR 4/3) moist; 12 percent clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 50 percent gravel; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 1.6 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

**Bw2**—21.5 to 60 inches (55 to 152 centimeters); brown (7.5YR 5/4) very gravelly sandy loam, brown (7.5YR 4/4) moist; 12 percent clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 55 percent gravel; slightly effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

**Clay content of control section (weighted average):** 11 to 16 percent

**A horizon:**
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—coarse sandy loam or sandy loam
- Clay content—8 to 18 percent

**Bw horizons:**
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—coarse sandy loam or sandy loam
- Clay content—8 to 18 percent
Diagnostic Features
• Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
• Cambic horizon—the zone from 3 to 60 inches (Bw1 and Bw2 horizons)

Description of Riverwash
Riverwash is very deep, excessively drained, stratified material consisting of unstabilized sandy, silty, clayey, and/or gravelly sediment that is part of a dynamic inter-braided system of bars and channels. This material is not stable and is subject to shifting and sorting. It is usually dry but can be transformed into a temporary water course or a short-lived torrent after large amounts of precipitation or excessive runoff within the watershed. Vegetation is usually not supported due to the constant scouring and shifting of sediments.

5—Akela-Lava flows-Armendaris association, 0 to 30 percent slopes

Map Unit Setting
Landform(s): Lava flows (fig. 5)
Elevation: 4,680 to 4,920 feet (1,426 to 1,500 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertič Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Akela and similar soils: 40 percent
Lava flows: 30 percent
Armendaris and similar soils: 20 percent
Minor components: 10 percent
   Adelino and similar soils
   Mimbres and similar soils
   Pajarito and similar soils
   Typic Haplargids that are moderately deep to bedrock and similar soils
   Typic Torriorthents that are moderately deep to bedrock and similar soils
   Wink and similar soils

Description of the Akela Soil

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

**Geomorphic position:** Stabilized eolian deposits on lava flows

**Parent material:** Alluvium and/or eolian deposits

**Slope:** 0 to 15 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

**Physical cover:**

- canopy plant cover—75 percent
- woody debris—5 percent
- bare soil—40 percent
- rock fragments—10 percent gravel

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

**Drainage class:** Well drained

\[
K_{sat} \text{ (solum)} = 5.95 \text{ to } 19.98 \text{ inches per hour (42.00 to 141.00 micrometers per second)}

K_{sat} \text{ (restrictive layer)} = 0.00 \text{ to } 0.01 \text{ inch per hour (0.00 to 0.07 micrometer per second)}

\]

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

**Shrink-swell potential:** About 1.1 LEP (low)

**Flooding hazard:** None

**Runoff class:** High

**Hydrologic group:** D

**Ecological site name:** Malpais

**Ecological site number:** R042XB037NM

**Present vegetation:** Black grama, alkali sacaton, and burrograss

**Land capability classification (nonirrigated areas):** 7c

Typical Pedon

**Location by Geographic Coordinate System:** lat. 33 degrees 34 minutes 9.80 seconds N. and long. 106 degrees 47 minutes 35.40 seconds W.

A—0 to 3 inches (0 to 8 centimeters); brown (7.5YR 5/4) very gravelly loam, brown (7.5YR 4/4) moist; 15 percent clay; weak medium platy structure; soft, very friable, slightly sticky, nonplastic; many very fine roots throughout; finely disseminated carbonate throughout; 50 percent gravel; strongly effervescent, 5 percent calcium
carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk1—3 to 6 inches (8 to 15 centimeters); light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; 17 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; many very fine roots throughout; finely disseminated carbonate throughout; 35 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk2—6 to 12 inches (15 to 30 centimeters); light brown (7.5YR 6/4) extremely cobbly loam, brown (7.5YR 4/4) moist; 16 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; many very fine roots throughout; finely disseminated carbonate throughout; 40 percent gravel and 40 percent cobbles; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

R—12 inches (30 centimeters); unweathered, unfractured, indurated, and carbonate-coated basalt.

Range in Characteristics

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

*Rock fragment content in control section: 35 to 90 percent*

*A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam or loam
- Clay content—10 to 18 percent
- Rock fragment content—35 to 60 percent

*Bk horizons:
- Hue—7.5YR or 10YR
- Value—4 to 7 dry; 4 to 6 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam or loam
- Clay content—10 to 18 percent
- Rock fragment content—35 to 90 percent
- Calcium carbonate equivalent—5 to 10 percent

Diagnostic Features

- Ochric epipedon—the zone from 0 to 7 inches (A, Bk1, and Bk2 horizons)
- Depth to lithic contact—12 inches (R horizon)

Description of Lava Flows

This component consists of exposures of solidified rock formed from the surficial outpouring of molten lava. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Description of the Armendaris Soil

*Taxonomic classification:* Fine, mixed, superactive, thermic Typic Haplargids

*Geomorphic position:* Circular depressions on lava flows

*Parent material:* Alluvium and/or eolian deposits

*Slope:* 0 to 1 percent

*Surface cover*
- Biological crust:
  - cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent

Chemical crust:
salt—0 percent
gypsum—0 percent

Physical cover:
canopy plant cover—85 percent
woody debris—5 percent
bare soil—15 percent
rock fragments—0 percent

Drainage class: Well drained

$K_{sat}$ (solum): 0.20 to 0.57 inch per hour (1.40 to 4.00 micrometers per second)
Available water capacity (total inches): 10.2 (very high)

Shrink-swell potential: About 7.8 LEP (high)

Flooding hazard: None
Runoff class: Low

Hydrologic group: C

Ecological site name: Draw

Ecological site number: R042XB016NM

Present vegetation: Alkali sacaton and burrograss

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 31 minutes 49.70 seconds N. and long. 106 degrees 53 minutes 43.30 seconds W.

A—0 to 2 inches (0 to 5 centimeters); light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; 18 percent clay; weak thick platy structure parting to moderate medium platy; soft, very friable, moderately sticky, moderately plastic; few very fine and common fine roots throughout; few very fine vesicular and few very fine dendritic tubular pores; very slightly effervescent, 1 percent calcium carbonate equivalent; neutral, pH 7.2; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bt1—2 to 5 inches (5 to 13 centimeters); light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/4) moist; 28 percent clay; weak medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; very few faint clay films on all faces of peds and very few faint clay films on surfaces along root channels; very slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bt2—5 to 15 inches (13 to 38 centimeters); brown (7.5YR 4/4) silt loam, dark brown (7.5YR 3/4) moist; 42 percent clay; strong coarse subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots throughout; common very fine dendritic tubular pores; few distinct clay films on surfaces along root channels and few distinct clay films on all faces of peds; very slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bt3—15 to 26 inches (38 to 66 centimeters); brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; 48 percent clay; moderate coarse subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and few fine roots throughout; few fine dendritic tubular pores; few distinct clay films on all faces of peds and few distinct clay films on surfaces along pores; very slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline; clear smooth boundary.
effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bt4—26 to 35 inches (66 to 89 centimeters); brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4) moist; 45 percent clay; weak coarse subangular blocky structure parting to moderate medium subangular blocky; hard, friable, moderately sticky, moderately plastic; common very fine and few fine roots throughout; common fine dendritic tubular pores; few distinct clay films on all faces of peds and few distinct clay films on surfaces along pores; slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk1—35 to 41 inches (89 to 104 centimeters); brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; 38 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few very fine and fine roots throughout; common very fine vesicular and fine dendritic tubular pores; common fine threadlike and common fine irregular carbonate masses throughout; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk2—41 to 49 inches (104 to 124 centimeters); light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 4/4) moist; 30 percent clay; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few very fine and fine roots throughout; common very fine vesicular and common fine dendritic tubular pores; finely disseminated carbonate and common fine irregular carbonate masses throughout; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

C—49 to 60 inches (124 to 152 centimeters); brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; 30 percent clay; weak fine subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few very fine and fine roots throughout; common very fine vesicular and common fine dendritic tubular pores; few fine irregular carbonate masses throughout; very slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 1.5 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 28 to 50 percent

A horizon:
Hue—7.5YR or 10YR
Value—5 to 6 dry; 3 to 4 moist
Chroma—3 to 4, dry or moist
Texture—silt loam or silty clay loam

Bt horizons:
Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 4 moist
Chroma—3 to 4, dry or moist
Texture—silty clay loam or silty clay
Clay content—28 to 50 percent

Bk and C horizons:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 to 6 most
Chroma—3 to 4, dry or moist
Texture—loam, silt loam, silty clay loam, or silty clay
Clay content—28 to 48 percent
Calcium carbonate equivalent—1 to 3 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 5 inches (A and Bt1 horizons)
• Argillic horizon—the zone from 5 to 35 inches (Bt1, Bt2, Bt3, and Bt4 horizons)

6—Aladdin-Eppenauer family-Petrocalcic Paleustolls complex, 1 to 60 percent slopes

Map Unit Setting
Landform(s): Fan piedmonts (fig. 6)
Elevation: 4,230 to 6,200 feet (1,288 to 1,889 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 57 to 61 degrees F (14.0 to 16.0 degrees C)
Mean annual soil temperature: 59 to 63 degrees F (15.1 to 17.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-5 Chihuahuan Desert Hills and Bajadas

Map Unit Composition
Aladdin and similar soils: 50 percent
Eppenauer family and similar soils: 20 percent
Petrocalcic Paleustolls and similar soils: 20 percent
Minor components: 10 percent
- Kinco and similar soils
- Mallet and similar soils
- Woodcutter and similar soils
- Riverwash
- Rock outcrop

Description of the Aladdin Soil

**Taxonomic classification:** Coarse-loamy, mixed, superactive, thermic Aridic Haplustolls

**Geomorphic position:** Fan remnants and alluvial fans between drainages

**Parent material:** Gravelly alluvium derived from granite

**Slope:** 1 to 30 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—55 percent
  - woody debris—15 percent
  - bare soil—10 percent
  - rock fragments—50 percent gravel

**Drainage class:** Somewhat excessively drained

**K<sub>sat</sub> (solum):** 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

**Available water capacity (total inches):** 5.4 (moderate)

**Shrink-swell potential:** About 1.3 LEP (low)

**Flooding hazard:** None

**Runoff class:** Very low

**Hydrologic group:** A

**Ecological site name:** Gravelly

**Ecological site number:** R042XD007NM

**Present vegetation:** Black grama, blue grama, and yucca

**Land capability classification (nonirrigated areas):** 6c

Typical Pedon

**Location by Geographic Coordinate System:** lat. 32 degrees 25 minutes 51.20 seconds N. and long. 106 degrees 32 minutes 45.40 seconds W.

**A—**0 to 3 inches (0 to 8 centimeters); brown (7.5YR 4/2) gravelly sandy loam, dark brown (7.5YR 3/2) moist; 14 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common medium and few fine roots throughout; common medium dendritic tubular pores; 25 percent gravel; noneffervescent; neutral, pH 7.1; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

**Bw1—**3 to 20 inches (8 to 51 centimeters); dark gray (7.5YR 4/1) gravelly sandy loam, very dark gray (7.5YR 3/1) moist; 15 percent clay; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; few medium and common fine roots throughout; common medium dendritic tubular pores; 28 percent gravel; noneffervescent; neutral, pH 6.9; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.
Bw2—20 to 25 inches (51 to 64 centimeters); dark gray (7.5YR 4/1) gravelly sandy loam, very dark gray (7.5YR 3/1) moist; 18 percent clay; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common fine roots throughout; common medium dendritic tubular pores; 32 percent gravel; noneffervescent; neutral, pH 7.0; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

BC—25 to 60 inches (64 to 152 centimeters); brown (7.5YR 4/4) gravelly sandy loam, brown (7.5YR 4/3) moist; 15 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few fine roots throughout; 34 percent gravel; noneffervescent; neutral, pH 6.9; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

*Clay content of control section (weighted average): 10 to 18 percent
Rock fragment content in control section: 15 to 35 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—2 to 4 dry; 1 to 3 moist
- Chroma—1 to 3, dry or moist
- Texture—sandy loam or sandy clay loam
- Clay content—10 to 25 percent
- Rock fragment content—15 to 35 percent

Bw horizons:
- Hue—7.5YR or 10YR
- Value—3 to 4 dry; 2 to 4 moist
- Chroma—1 to 4, dry or moist
- Texture—coarse sandy loam or sandy loam
- Clay content—10 to 18 percent
- Rock fragment content—15 to 35 percent
- Calcium carbonate equivalent—5 to 15 percent

BC horizon:
- Hue—7.5YR or 10YR
- Value—3 to 5 dry; 2 to 5 moist
- Chroma—2 to 6, dry or moist
- Texture—loamy sand, coarse sandy loam, or sandy loam
- Clay content—6 to 18 percent
- Rock fragment content—10 to 35 percent

Diagnostic Features
- Mollic epipedon—the zone from 0 to 20 inches (A and Bw1 horizons)
- Cambic horizon—the zone from 3 to 25 inches (Bw1 and Bw2 horizons)

Description of the Eppenauer Family Soil

*Taxonomic classification: Fine-loamy, mixed, superactive, thermic Aridic Argiustolls
Geomorphic position: Pediments below the base of granitic bedrock hills
Parent material: Gravelly alluvium derived from granite
Slope: 3 to 60 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent

Physical cover:
  canopy plant cover—45 percent
  woody debris—10 percent
  bare soil—10 percent
  rock fragments—40 percent gravel, 10 percent cobbles, 5 percent stones, and 1 percent boulders

Depth to restrictive feature(s): 18 to 30 inches to paralithic bedrock; 30 to 31 inches to lithic bedrock

Drainage class: Moderately well drained

$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

$K_{sat}$ (restrictive layer): 0.00 to 0.20 inch per hour (0.00 to 1.40 micrometers per second)

Available water capacity (total inches): 2.1 (very low)

Shrink-swell potential: About 3.3 LEP (moderate)

Flooding hazard: None

Runoff class: Very high

Hydrologic group: D

Ecological site name: Gravelly

Ecological site number: R042XD007NM

Present vegetation: Black grama, Torrey ephedra, fishhook barrel cactus, pricklypear, and yucca

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 26 minutes 35.00 seconds N. and long. 106 degrees 33 minutes 22.70 seconds W.

A—0 to 2 inches (0 to 5 centimeters); dark brown (7.5YR 3/2) gravelly sandy loam, very dark brown (7.5YR 2.5/2) moist; 17 percent clay; moderate medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and common fine roots throughout; common fine dendritic tubular pores; 18 percent gravel; noneffervescent; neutral, pH 6.9; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bt1—2 to 12 inches (5 to 30 centimeters); dark reddish brown (5YR 3/3) gravelly sandy clay loam, black (5YR 2.5/1) moist; 30 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; few very fine dendritic tubular pores; few faint clay films on all faces of peds; 20 percent gravel and 2 percent cobbles; noneffervescent; neutral, pH 7.1; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bt2—12 to 19.5 inches (30 to 50 centimeters); reddish brown (5YR 4/3) gravelly sandy clay loam, dark reddish brown (5YR 3/4) moist; 33 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; few distinct clay films on all faces of peds; 29 percent gravel and 5 percent cobbles; noneffervescent; neutral, pH 6.9; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Cr—19.5 to 30.5 inches (50 to 78 centimeters); weathered, fractured, and moderately cemented granite.

R—30.5 inches (78 centimeters); unweathered, unfractured, and very strongly cemented granite.
Range in Characteristics

Note: Eppenauer family soils differ from the Eppenauer series in that the series does not have noncalcareous granitic parent material or neutral pH.

Clay content of control section (weighted average): 16 to 35 percent
Rock fragment content in control section: 5 to 35 percent

A horizon:
- Hue—7.5YR
- Value—2 to 4 dry; 1 to 3 moist
- Chroma—1 to 3, dry or moist
- Texture—loamy coarse sand, coarse sandy loam, sandy loam, or sandy clay loam
- Clay content—5 to 30 percent
- Rock fragment content—5 to 35 percent

Bt horizons:
- Hue—5YR or 7.5YR
- Value—2 to 5 dry; 1 to 4 moist
- Chroma—1 to 4, dry or moist
- Texture—sandy loam or sandy clay loam
- Clay content—16 to 35 percent
- Rock fragment content—5 to 35 percent

Diagnostic Features

- Mollic epipedon—the zone from 0 to 12 inches (A and Bt1 horizons)
- Argillic horizon—the zone from 2 to 19.5 inches (Bt1 and Bt2 horizons)
- Depth to paralithic contact—19.5 inches (Cr horizon)
- Depth to lithic contact—30.5 inches (R horizon)

Description of the Petrocalcic Paleustolls

Taxonomic classification: Petrocalcic Paleustolls
Geomorphic position: Fan remnants between drainages influenced by limestone parent material
Parent material: Gravelly alluvium derived from granite
Slope: 1 to 15 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—50 percent
  - woody debris—10 percent
  - bare soil—15 percent
  - rock fragments—40 percent gravel and 2 percent cobbles

Depth to restrictive feature(s): 16 to 20 inches to petrocalcic horizon
Drainage class: Well drained

\( K_{sat} \) (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

\( K_{sat} \) (restrictive layer): 0.00 inches per hour (0.00 to 0.02 micrometer per second)

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

Shrink-swell potential: About 3.4 LEP (moderate)

Flooding hazard: None
Runoff class: Very high
Hydrologic group: D
Ecological site name: Gravelly
Ecological site number: R042XD007NM
Present vegetation: Black grama, Lehmann lovegrass, pricklypear, and soaptree yucca
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 26 minutes 29.30 seconds N. and long. 106 degrees 32 minutes 26.10 seconds W.

A—0 to 2 inches (0 to 5 centimeters); dark brown (7.5YR 3/3) gravelly coarse sandy loam, dark brown (7.5YR 3/3) moist; 12 percent clay; weak fine subangular blocky and moderate fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and few fine roots throughout; 25 percent gravel and 5 percent cobbles; noneffervescent; neutral, pH 6.6; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bt—2 to 9 inches (5 to 23 centimeters); dark brown (7.5YR 3/3) sandy clay loam, dark brown (7.5YR 3/2) moist; 24 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; common medium and few fine dendritic tubular pores; few faint clay films on all faces of peds; 10 percent gravel and 3 percent cobbles; noneffervescent; neutral, pH 6.9; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Btk—9 to 18 inches (23 to 46 centimeters); reddish brown (5YR 4/4) gravelly sandy clay loam, reddish brown (5YR 4/3) moist; 32 percent clay; moderate fine subangular blocky structure; slightly hard, friable, very sticky, very plastic; few distinct clay films on all faces of peds; common fine irregular carbonate masses throughout; 20 percent gravel and 5 percent cobbles; slightly effervescent, 3 percent calcium carbonate equivalent; neutral, pH 7.3; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; very abrupt smooth boundary.

2Bkkm—18 inches (46 centimeters); very pale brown (10YR 8/2) cemented material, very pale brown (10YR 8/3) moist; violently effervescent, 32 percent calcium carbonate equivalent.

Range in Characteristics

Note: Petrocalcic Paleustolls have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 20 to 35 percent
Rock fragment content in control section: 5 to 35 percent

A horizon:
  Hue—7.5YR or 10YR
  Value—2 to 4 dry; 1 to 3 moist
  Chroma—2 to 4, dry or moist
  Texture—coarse sandy loam or sandy loam
  Clay content—8 to 18 percent
  Rock fragment content—5 to 35 percent

Bt horizon:
  Hue—5YR or 7.5YR
  Value—2 to 4 dry; 1 to 3 moist
  Chroma—1 to 4, dry or moist
  Clay content—20 to 35 percent
  Rock fragment content—5 to 35 percent
Btk horizon:
   Hue—5YR or 7.5YR
   Value—4 to 6 dry; 3 to 5 moist
   Chroma—2 to 4, dry or moist
   Clay content—20 to 35 percent
   Rock fragment content—5 to 35 percent
   Calcium carbonate equivalent—1 to 5 percent
   Gypsum content—5 to 15 percent

2Bkkm horizon:
   Cemented material—calcium carbonate
   Hardness—indurated
   Thickness—18 to 45 inches; laterally continuous

Diagnostic Features
• Mollic epipedon—the zone from 0 to 9 inches (A and Bt horizons)
• Argillic horizon—the zone from 2 to 18 inches (Bt and Btk horizons)
• Depth to petrocalcic horizon—18 inches (2Bkkm horizon)

7—Aridic Lithic Argiustolls-Aridic Argiustolls complex, 15 to 75 percent slopes

Map Unit Setting

Landform(s): Mountains (fig. 7)
Elevation: 5,180 to 7,350 feet (1,580 to 2,240 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (8.0 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (9.1 to 11.1 degrees C)
Frost-free period: 120 to 180 days
Major Land Resource Area: 70C—Central New Mexico Highlands
Land Resource Unit: 70C.1 Central New Mexico Highlands

Map Unit Composition

Aridic Lithic Argiustolls and similar soils: 50 percent
Aridic Argiustolls and similar soils: 45 percent
Minor components: 5 percent
  Argiustolls with a loamy-skeletal particle-size class and similar soils
  Deama and similar soils
  Penagua and similar soils
  Riverwash
  Rock outcrop

Description of the Aridic Lithic Argiustolls

Taxonomic classification: Aridic Lithic Argiustolls
Geomorphic position: Summits, shoulders, and backslopes of sandstone and shale mountains
Parent material: Clayey residuum weathered from limestone and shale
Slope: 15 to 75 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—80 percent
    woody debris—20 percent
    bare soil—3 percent
    rock fragments—65 percent gravel and 10 percent cobbles
Depth to restrictive feature(s): 4 to 20 inches to lithic bedrock
Drainage class: Well drained
\( K_{sat} \) (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)
\( K_{sat} \) (restrictive layer): 0.00 to 0.06 inch per hour (0.01 to 0.42 micrometer per second)
Available water capacity (total inches): 2.1 (very low)
Shrink-swell potential: About 4.7 LEP (moderate)
Flooding hazard: None
Runoff class: Very high
Hydrologic group: D
Ecological site name: Juniperus monosperma-Pinus edulis/Chrysothamnus nauseosus/Bouteloua gracilis-Bouteloua curtipendula
Ecological site number: F070CY125NM
Present vegetation: Blue grama, juniper, oak, pinyon, pricklypear, sacahuista, sideoats grama, sumac, and yucca
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 44 minutes 13.89 seconds N. and long. 106 degrees 18 minutes 42.87 seconds W.
A—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 4/3) gravelly silt loam, dark brown (7.5YR 3/3) moist; 25 percent clay; weak very fine granular structure; soft, friable, moderately sticky, moderately plastic; common very fine and fine roots throughout; common fine dendritic tubular pores; finely disseminated carbonate throughout; 15 percent gravel and 5 percent cobbles; strongly effervescent, 10 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Btk1—4 to 12 inches (10 to 31 centimeters); brown (7.5YR 4/3) gravelly silty clay loam, dark brown (7.5YR 3/3) moist; 37 percent clay; moderate very fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots throughout; common fine dendritic tubular pores; very few faint clay films on surfaces along pores; finely disseminated carbonate throughout; 11 percent gravel and 5 percent cobbles; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Btk2—12 to 14 inches (31 to 36 centimeters); brown (7.5YR 4/3) gravelly silty clay loam, dark brown (7.5YR 3/3) moist; 35 percent clay; moderate very fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots throughout; few fine dendritic tubular pores; very few faint clay films on surfaces along pores; finely disseminated carbonate throughout; 11 percent gravel and 5 percent cobbles; violently effervescent, 22 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; very abrupt wavy boundary.

R—14 inches (36 centimeters); unweathered, unfractured, and indurated sandstone and shale.

**Range in Characteristics**

*Note: Ardic Lithic Argiustolls have soil properties that vary beyond family class limits.*

**Clay content of control section (weighted average):** 27 to 55 percent  
**Rock fragment content in control section:** 10 to 60 percent  
**Other characteristics:** Some pedons have a thin Cr horizon

**A horizon:**
- Hue—2.5YR, 5YR, or 7.5YR  
- Value—2 to 4 dry; 1 to 3 moist  
- Chroma—1 to 4, dry or moist  
- Texture—loam, clay loam, silt loam, or silty clay loam  
- Clay content—16 to 40 percent  
- Rock fragment content—10 to 60 percent  
- Reaction—neutral to moderately alkaline

**Btk horizons:**
- Hue—2.5YR, 5YR, or 7.5YR  
- Value—2 to 6 dry; 1 to 5 moist  
- Chroma—1 to 4, dry or moist  
- Texture—clay loam, silt loam, silty clay loam, silty clay, or clay  
- Clay content—15 to 55 percent  
- Rock fragment content—10 to 60 percent  
- Reaction—neutral to moderately alkaline  
- Salinity—nonsaline or very slightly saline
Diagnostic Features
- Mollic epipedon—the zone from 0 to 14 inches (A and Btk1 horizons)
- Argillic horizon—the zone from 4 to 14 inches (Btk1 and Btk2 horizons)
- Depth to lithic contact—14 inches (R horizon)

Description of the Aridic Argiustolls

**Taxonomic classification:** Fine, mixed, superactive, mesic Aridic Argiustolls

**Geomorphic position:** Backslopes and footslopes of sandstone and shale mountains

**Parent material:** Clayey alluvium derived from shale

**Slope:** 15 to 50 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—75 percent
  - woody debris—25 percent
  - bare soil—10 percent
  - rock fragments—25 percent gravel

**Depth to restrictive feature(s):** 35 to 39 inches to paralithic bedrock

**Drainage class:** Moderately well drained

**$K_{sat}$ (solum):** 0.06 to 0.57 inch per hour (0.42 micrometers to 4.00 micrometers per second)

**$K_{sat}$ (restrictive layer):** 0.00 to 0.20 inch per hour (0.00 to 1.40 micrometers per second)

**Available water capacity (total inches):** 5.9 (moderate)

**Shrink-swell potential:** About 7.2 LEP (high)

**Flooding hazard:** None

**Runoff class:** Very high

**Hydrologic group:** D

**Ecological site name:** Juniperus monosperma-Pinus edulis/Chrysothamnus nauseosus/Bouteloua gracilis-Bouteloua curtipendula

**Ecological site number:** F070CY125NM

**Present vegetation:** Juniper, oak, pinyon, pricklypear, and yucca

**Land capability classification (nonirrigated areas):** 6c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 33 degrees 44 minutes 20.76 seconds N. and long. 106 degrees 18 minutes 50.32 seconds W.

**A—0 to 3 inches (0 to 8 centimeters):** reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) moist; 36 percent clay; moderate very fine granular structure; slightly hard, friable, moderately sticky, moderately plastic; common fine and medium roots throughout; common very fine and fine dendritic tubular pores; finely disseminated carbonate throughout; 5 percent gravel; strongly effervescent, 9 percent calcium carbonate equivalent; neutral, pH 7.2; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

**Bt—3 to 13 inches (8 to 33 centimeters):** reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; 41 percent clay; moderate fine and medium angular blocky structure; very hard, very firm, moderately sticky, moderately plastic; common
fine and medium roots throughout; common very fine and fine dendritic tubular pores; few faint clay films on surfaces along pores; finely disseminated carbonate throughout; 5 percent gravel and 2 percent cobbles; strongly effervescent, 10 percent calcium carbonate equivalent; neutral, pH 7.3; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Btk1—13 to 24 inches (33 to 61 centimeters); reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; 46 percent clay; moderate very fine and fine angular blocky structure; very hard, very firm, moderately sticky, moderately plastic; few fine and medium roots throughout; few very fine and fine dendritic tubular pores; very few faint clay films on surfaces along pores; few very fine irregular carbonate masses throughout; 3 percent gravel and 2 percent cobbles; strongly effervescent, 10 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Btk2—24 to 34 inches (61 to 86 centimeters); reddish brown (5YR 4/4) silty clay loam, dark reddish brown (5YR 3/4) moist; 32 percent clay; weak medium subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; few fine and medium roots throughout; very few faint clay films on surfaces along pores; common very fine irregular carbonate masses throughout; 10 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent; slightly alkaline, pH 7.5; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

BCk—34 to 38 inches (86 to 97 centimeters); reddish brown (5YR 4/4) extremely gravelly silty clay loam, dark reddish brown (5YR 3/4) moist; 34 percent clay; weak medium subangular blocky structure; very hard, very firm, slightly sticky, slightly plastic; common very fine irregular carbonate masses throughout; 70 percent gravel; strongly effervescent, 9 percent calcium carbonate equivalent; slightly alkaline, pH 7.5; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Cr—38 inches (97 centimeters); weathered, fractured, and moderately cemented sandstone and shale.

Range in Characteristics

Note: Aridic Argiustolls have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 27 to 60 percent
Other characteristics: Some pedons do not have a Cr horizon

A horizon:
- Hue—2.5YR to 7.5YR
- Value—2 to 4 dry; 1 to 3 moist
- Chroma—1 to 3, dry or moist
- Texture—silt loam, clay loam, or silty clay loam
- Clay content—20 to 40 percent
- Rock fragment content—0 to 25 percent
- Reaction—neutral or slightly alkaline

Bt horizon:
- Hue—2.5YR to 7.5YR
- Value—2 to 5 dry; 1 to 4 moist
- Chroma—1 to 4, dry or moist
- Texture—silty clay loam or clay
- Clay content—27 to 60 percent
- Rock fragment content—0 to 35 percent
- Reaction—neutral or slightly alkaline
Btk horizons:
Hue—2.5YR to 7.5YR
Value—3 to 5 dry; 2 to 4 moist
Chroma—1 to 4, dry or moist
Texture—silty clay loam, silty clay, or clay
Clay content—27 to 60 percent
Rock fragment content—0 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—neutral or slightly alkaline

Bck horizon:
Hue—2.5YR to 7.5YR
Value—3 to 5 dry; 2 to 4 moist
Chroma—1 to 4, dry or moist
Texture—silty clay loam, silty clay, or clay
Clay content—27 to 60 percent
Rock fragment content—0 to 75 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—neutral or slightly alkaline

Diagnostic Features
- Mollic epipedon—the zone from 0 to 13 inches (A and Bt horizons)
- Argillic horizon—the zone from 3 to 34 inches (Bt, Btk1, and Btk2 horizons)
- Depth to paralithic contact—38 inches (Cr horizon)

8—Aridic Lithic Argiustolls-Calcidic Argiustolls-Aridic Haplustolls complex, 10 to 90 percent slopes

Map Unit Setting

Landform(s): Mountains (fig. 8)
Elevation: 5,110 to 7,490 feet (1,557 to 2,284 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (8.0 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (9.1 to 11.1 degrees C)
Frost-free period: 120 to 180 days
Major Land Resource Area: 70C—Central New Mexico Highlands
Land Resource Unit: 70C.1 Central New Mexico Highlands

Map Unit Composition
Aridic Lithic Argiustolls and similar soils: 40 percent
Calcidic Argiustolls and similar soils: 25 percent
Aridic Haplustolls and similar soils: 20 percent
Minor components: 15 percent
- Argiustolls, deep and similar soils
- Deama and similar soils
- Penagua and similar soils
- Tamarindo and similar soils
- Riverwash
- Rock outcrop

Description of the Aridic Lithic Argiustolls

Taxonomic classification: Aridic Lithic Argiustolls
Geomorphic position: Backslopes, shoulders, and summits of sandstone and shale mountains
Parent material: Gravelly alluvium derived from sandstone and shale
Slope: 10 to 90 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—75 percent
    woody debris—20 percent
    bare soil—10 percent
    rock fragments—33 percent gravel, 5 percent cobbles, and 1 percent stones
Depth to restrictive feature(s): 4 to 20 inches to lithic bedrock
Drainage class: Well drained
$K_{sat}$ (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)
Available water capacity (total inches): 1.0 (very low)
Shrink-swell potential: About 2.2 LEP (low)
Flooding hazard: None
Runoff class: High
Hydrologic group: D
Ecological site name: Shallow Sandstone
Ecological site number: R070CY116NM
Present vegetation: Blue grama and oneseed juniper
Land capability classification (nonirrigated areas): 6c

Typical Pedon (fig. 9)

Location by Geographic Coordinate System: lat. 33 degrees 16 minutes 50.60 seconds N. and long. 106 degrees 40 minutes 28.10 seconds W.

A—0 to 2 inches (0 to 5 centimeters); dark reddish brown (2.5YR 3/3) very gravelly loam, dark reddish brown (2.5YR 2.5/3) moist; 24 percent clay; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine and medium roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 40 percent gravel and 2 percent cobbles; slightly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Btk—2 to 10 inches (5 to 25 centimeters); dark reddish brown (2.5YR 3/3) very gravelly clay loam, dark reddish brown (2.5YR 2.5/3) moist; 31 percent clay; weak medium subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; few medium and common fine roots throughout; few fine dendritic tubular pores; few faint clay films on all faces of peds; common fine irregular carbonate masses throughout; 42 percent gravel and 5 percent cobbles; strongly effervescent, 9 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

R—10 inches (25 centimeters); unweathered, unfractured, and indurated sandstone and shale.
Range in Characteristics

Note: Aridic Lithic Argiustolls have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 27 to 55 percent
Rock fragment content in control section: 10 to 60 percent
Other characteristics: Some pedons have a thin Cr horizon

A horizon:
- Hue—2.5YR, 5YR, or 7.5YR
- Value—2 to 4 dry; 1 to 3 moist
- Chroma—1 to 4, dry or moist
- Texture—loam, clay loam, silt loam, or silty clay loam
- Clay content—16 to 40 percent
- Rock fragment content—10 to 60 percent
- Reaction—neutral to moderately alkaline

Btk horizon:
- Hue—2.5YR, 5YR, or 7.5YR
- Value—2 to 6 dry; 1 to 5 moist
- Chroma—1 to 4, dry or moist
- Texture—clay loam, silt loam, silty clay loam, silty clay, or clay
- Clay content—15 to 55 percent
- Rock fragment content—10 to 60 percent
- Reaction—neutral to moderately alkaline
- Salinity—nonsaline or very slightly saline

Diagnostic Features
- Mollic epipedon—the zone from 0 to 10 inches (A and Btk horizons)
- Argillic horizon—the zone from 2 to 10 inches (Btk horizon)
- Depth to lithic contact—10 inches (R horizon)

Description of the Calcidic Argiustolls

Taxonomic classification: Calcidic Argiustolls
Geomorphic position: Backslopes, shoulders, and summits of sandstone and shale mountains
Parent material: Gravelly colluvium derived from sandstone and shale
Slope: 10 to 90 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
Physical cover:
- canopy plant cover—70 percent
- woody debris—15 percent
- bare soil—3 percent
- rock fragments—40 percent gravel, 20 percent cobbles, and 10 percent stones

Depth to restrictive feature(s): 24 to 30 inches to lithic bedrock
Drainage class: Moderately well drained
K_sat (solum): 0.57 inch to 19.98 inches per hour (4.00 to 141.00 micrometers per second)
$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)
Available water capacity (total inches): 2.8 (low)
Shrink-swell potential: About 2.7 LEP (low)
Flooding hazard: None
Runoff class: Medium
Hydrologic group: B
Ecological site name: Gravelly
Ecological site number: R070CY119NM
Present vegetation: Threeawn, black grama, blue grama, cactus, mountain mahogany, and soaptree yucca
Land capability classification (nonirrigated areas): 6c

**Typical Pedon** (fig. 10)

*Location by Geographic Coordinate System:* lat. 33 degrees 15 minutes 50.20 seconds N. and long. 106 degrees 40 minutes 6.50 seconds W.

A1—0 to 2 inches (0 to 5 centimeters); dark reddish brown (2.5YR 3/3) very gravelly loam, dusky red (2.5YR 3/2) moist; 16 percent clay; weak thin platy structure parting to moderate medium granular; slightly hard, friable, moderately sticky, moderately plastic; few medium, many very fine, and common fine roots throughout; many very fine dendritic tubular pores; 35 percent gravel, 15 percent...
cobbles, and 5 percent stones; noneffervescent; slightly alkaline, pH 7.8; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

A2—2 to 5 inches (5 to 13 centimeters); dark reddish brown (2.5YR 3/3) very cobbly silty clay loam, dusky red (2.5YR 3/2) moist; 27 percent clay; weak medium subangular blocky structure; slightly hard, friable, moderately sticky, very plastic; few medium and many very fine and fine roots throughout; many very fine dendritic tubular pores; 15 percent gravel, 15 percent cobbles, and 5 percent stones; noneffervescent; slightly alkaline, pH 7.6; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bt—5 to 11.5 inches (13 to 29 centimeters); dark reddish brown (2.5YR 3/4) very cobbly clay loam, dark reddish brown (2.5YR 3/3) moist; 33 percent clay; moderate medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few very fine and common fine roots throughout; many fine dendritic tubular pores; common distinct clay films on all faces of peds; 25 percent gravel, 20 percent cobbles, and 5 percent stones; noneffervescent; slightly alkaline, pH 7.7; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; diffuse wavy boundary.

Btk1—11.5 to 22 inches (29 to 56 centimeters); reddish brown (2.5YR 4/4) very cobbly clay loam, reddish brown (2.5YR 4/3) moist; 31 percent clay; moderate medium subangular blocky structure parting to moderate fine angular blocky; very hard, firm, very sticky, very plastic; few very fine and common fine roots throughout; common very fine and fine dendritic tubular pores; very many distinct clay films on all faces of peds; common fine irregular carbonate nodules throughout; 20 percent gravel, 15 percent cobbles, and 5 percent stones; slightly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; diffuse smooth boundary.

Btk2—22 to 28.5 inches (56 to 73 centimeters); light reddish brown (2.5YR 6/4) gravelly sandy clay loam, red (2.5YR 4/6) moist; 27 percent clay; weak medium platy structure; hard, firm, very sticky, moderately plastic; common very fine and few fine roots throughout; few fine dendritic tubular pores; common prominent clay films on all faces of peds; finely disseminated carbonate throughout; 20 percent gravel and 2 percent cobbles; violently effervescent, 29 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline.

R—28.5 inches (73 centimeters); unweathered, unfractured, and indurated sandstone and shale.

Range in Characteristics

Note: Calcidic Argiustolls have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 25 to 35 percent
Rock fragment content in control section: 35 to 80 percent
Other characteristics: Some pedons have a thin Cr horizon

A horizons:
Hue—2.5YR or 5YR
Value—3 to 4 dry; 2 to 3 moist
Chroma—2 to 4, dry or moist
Texture—loam, clay loam, or silty clay loam
Clay content—16 to 35 percent
Rock fragment content—3 to 60 percent
Reaction—neutral or slightly alkaline

Bt horizon:
Hue—2.5YR or 5YR
Value—3 to 4 dry; 2 to 3 moist
Chroma—2 to 4, dry or moist
Texture—loam, sandy clay loam, or clay loam
Clay content—19 to 36 percent
Rock fragment content—35 to 50 percent
Reaction—neutral or slightly alkaline

Btk horizons:
Hue—2.5YR or 5YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—3 to 6, dry or moist
Texture—sandy clay loam, clay loam, or clay
Clay content—27 to 52 percent
Rock fragment content—20 to 80 percent
Calcium carbonate equivalent—5 to 35 percent
Reaction—neutral to moderately alkaline
Salinity—nonsaline or very slightly saline

Diagnostic Features
• Mollic epipedon—the zone from 0 to 11.5 inches (A1, A2, and Bt horizons)
• Argillic horizon—the zone from 5 to 28.5 inches (Bt, Btk1, and Btk2 horizons)
• Calcic horizon—the zone from 22 to 28.5 inches (Btk2 horizon)
• Depth to lithic contact—28.5 inches (R horizon)

Description of the Aridic Haplustolls

Taxonomic classification: Aridic Haplustolls
Geomorphic position: Backslopes and footslopes of sandstone and shale mountains
Parent material: Clayey colluvium derived from shale and siltstone
Slope: 10 to 60 percent
Surface cover
Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
  cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—65 percent
  woody debris—10 percent
  bare soil—3 percent
  rock fragments—60 percent channers and 15 percent flagstones

Drainage class: Well drained
$K_{sat}$ (solum): 0.06 inch to 5.95 inches per hour (0.42 micrometer to 42.00 micrometers per second)
Available water capacity (total inches): 6.0 (moderate)
Shrink-swell potential: About 5.7 LEP (moderate)
Flooding hazard: None
Runoff class: Very high
Hydrologic group: C
Ecological site name: Sandstone Hills
Ecological site number: R070CY117NM
Present vegetation: Black grama and blue grama
Land capability classification (nonirrigated areas): 6c
Figure 11.—Profile of the Aridic Haplustolls in map unit 8 (Aridic Lithic Argiustolls-Calcidic Argiustolls-Aridic Haplustolls complex, 10 to 90 percent slopes). Scale is in centimeters.

**Typical Pedon** (fig. 11)

*Location by Geographic Coordinate System:* lat. 33 degrees 15 minutes 52.00 seconds N. and long. 106 degrees 39 minutes 57.40 seconds W.
A—0 to 2 inches (0 to 5 centimeters); reddish brown (5YR 4/3) extremely channery clay loam, dark reddish brown (5YR 3/3) moist; 38 percent clay; weak thick platy over moderate fine granular structure; soft, very friable, moderately sticky, moderately plastic; few medium and common very fine and fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate throughout; 55 percent channers and 15 percent flagstones; slightly effervescent, 3 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw—2 to 14 inches (5 to 35 centimeters); reddish brown (5YR 4/3) very channery clay, dark reddish brown (5YR 3/3) moist; 44 percent clay; strong fine and medium subangular blocky structure; very hard, friable, very sticky, very plastic; common fine and medium and few very fine and coarse roots throughout; common very fine and few fine dendritic tubular pores; finely disseminated carbonate throughout; 35 percent channers and 5 percent flagstones; slightly effervescent, 3 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk1—14 to 40 inches (35 to 101 centimeters); reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; 41 percent clay; strong fine subangular blocky structure; hard, firm, very sticky, very plastic; few very fine, fine, and medium roots throughout; few very fine and medium and common fine dendritic tubular pores; common very fine irregular carbonate masses throughout; 10 percent gravel; strongly effervescent, 7 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk2—40 to 60 inches (101 to 152 centimeters); reddish brown (5YR 4/4) extremely gravelly clay, dark reddish brown (5YR 3/4) moist; 42 percent clay; moderate fine subangular blocky structure; hard, firm, very sticky, very plastic; few very fine and common fine roots throughout; few very fine and medium dendritic tubular pores; common very fine irregular carbonate masses throughout; 65 percent gravel; slightly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Note: Aridic Haplustolls have soil properties that vary beyond family class limits.*

**Clay content of control section (weighted average):** 27 to 65 percent; average of more than 35 percent

**Rock fragment content in control section:** 10 to 65 percent

**Other characteristics:** Some pedons have a thick Cr horizon

**A horizon:**
- **Hue:** 2.5YR or 5YR
- **Value:** 3 to 4 dry; 2 to 3 moist
- **Chroma:** 2 to 3, dry or moist
- **Texture:** loam, clay loam, or silty clay loam
- **Clay content:** 18 to 38 percent
- **Rock fragment content:** 15 to 70 percent
- **Reaction:** neutral or slightly alkaline

**Bw horizon:**
- **Hue:** 2.5YR or 5YR
- **Value:** 3 to 4 dry; 2 to 3 moist
- **Chroma:** 2 to 3, dry or moist
- **Texture:** clay loam, silty clay loam, or clay
- **Clay content:** 27 to 50 percent
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Figure 12.—An area of map unit 9 (Astrobee-Lark association, 0 to 35 percent slopes).

Rock fragment content—25 to 50 percent
Reaction—neutral or slightly alkaline

*Bk* horizons:
- Hue—2.5YR or 5YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—sandy clay loam, clay loam, or clay
- Clay content—27 to 65 percent
- Rock fragment content—10 to 65 percent
- Calcium carbonate equivalent—5 to 10 percent
- Reaction—neutral or slightly alkaline
- Salinity—nonsaline or very slightly saline

**Diagnostic Features**
- Mollic epipedon—the zone from 0 to 14 inches (A and Bw horizons)
- Cambic horizon—the zone from 2 to 14 inches (Bw horizon)

**9—Astrobee-Lark association, 0 to 35 percent slopes**

**Map Unit Setting**

*Landform(s):* Dunes and interdunes (fig. 12)
*Elevation:* 3,970 to 4,140 feet (1,210 to 1,261 meters)
*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)
*Mean annual air temperature:* 64 to 70 degrees F (18.0 to 21.0 degrees C)
*Mean annual soil temperature:* 66 to 72 degrees F (19.1 to 22.1 degrees C)
*Frost-free period:* 180 to 240 days
*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains
*Land Resource Unit:* 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Astrobee and similar soils: 70 percent
Lark and similar soils: 25 percent
Minor components: 5 percent
  Transformer and similar soils
  Duneland

Description of the Astrobee Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: Interdunes and cryptogamic covered low parabolic dune traces
Parent material: Gypsiferous eolian sands
Slope: 0 to 3 percent

Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—70 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—20 percent
    woody debris—15 percent
    bare soil—10 percent
    rock fragments—0 percent

Drainage class: Excessively drained

$K_{sat}$ (solum): 0.57 inch to 99.92 inches per hour (4.00 to 705.00 micrometers per second)

Available water capacity (total inches): 6.7 (moderate)

Flooding hazard: None

Runoff class: Negligible

Hydrologic group: B

Ecological site name: Gyp Interdune (Dry)

Ecological site number: R042XB005NM

Present vegetation: Gyp dropseed and Torrey’s jointfir

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 13)

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 8.36 seconds N. and long. 106 degrees 10 minutes 19.33 seconds W.

Ayy—0 to 4 inches (0 to 10 centimeters); pale brown (10YR 6/3) gypsiferous very fine sandy loam, brown (10YR 5/3) moist; 8 percent clay; weak medium and fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine roots throughout; common fine tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 86 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 2.9 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Byy1—4 to 15 inches (10 to 38 centimeters); very pale brown (10YR 7/3) gypsiferous very fine sandy loam, yellowish brown (10YR 5/4) moist; 8 percent clay; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic;
common very fine and fine roots throughout; common fine tubular pores; finely disseminated carbonate, common medium irregular gypsum masses, and many very fine irregular gypsum crystals throughout; very slightly effervescent, 1 percent calcium carbonate equivalent and 90 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 2.9 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Byy2—15 to 19.5 inches (38 to 50 centimeters); white (10YR 8/1) gypsiferous sand, very pale brown (10YR 7/3) moist; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; common fine and medium irregular gypsum masses and many fine irregular gypsum crystals throughout; noneffervescent, 89 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 3.7 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Cyy1—19.5 to 38 inches (50 to 96 centimeters); white (10YR 8/1) gypsiferous sand, very pale brown (10YR 8/2) moist; weak very coarse prismatic structure; slightly hard, friable, nonsticky, nonplastic; common medium roots throughout; many fine irregular gypsum crystals throughout; noneffervescent, 93 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 4.5 dS/m (mmhos/cm); slightly saline; diffuse wavy boundary.
Cyy2—38 to 64 inches (96 to 162 centimeters); white (10YR 8/1) gypsiferous sand, very pale brown (10YR 8/2) moist; weak very coarse prismatic structure; slightly hard, friable, nonsticky, nonplastic; many fine irregular gypsum crystals throughout; noneffervescent, 93 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 4.0 dS/m (mmhos/cm); slightly saline; gradual wavy boundary.

Cyy3—64 to 78.5 inches (162 to 200 centimeters); 10 percent dark brown (10YR 3/3), 20 percent yellowish brown (10YR 5/4), and 70 percent white (10YR 8/1) gypsiferous sand, 10 percent very dark brown (10YR 2/2), 20 percent dark yellowish brown (10YR 4/4), and 70 percent white (10YR 8/1) moist; massive; soft, very friable, nonsticky, nonplastic; many fine irregular gypsum crystals throughout; noneffervescent, 91 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 3.0 dS/m (mmhos/cm); very slightly saline.

**Range in Characteristics**

**Clay content of control section (weighted average): 0 to 8 percent**

*Ayy horizon:*
- Hue—2.5Y or 10YR
- Value—6 to 8 dry; 5 to 7 moist
- Chroma—2 to 3, dry or moist
- Texture—gypsiferous loamy fine sand or gypsiferous very fine sandy loam
- Clay content—0 to 8 percent
- Salinity—very slightly saline or slightly saline
- Gypsum content—75 to 95 percent

*Byy horizons:*
- Hue—2.5Y or 10YR
- Value—7 to 9.5 dry; 5 to 8.5 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sand, gypsiferous loamy fine sand, or gypsiferous very fine sandy loam
- Clay content—0 to 8 percent
- Salinity—very slightly saline or slightly saline
- Gypsum content—80 to 95 percent

*Cyy horizons:*
- Hue—10YR or 2.5Y
- Value—3 to 9 dry; 2 to 8.5 moist
- Chroma—1 to 6, dry or moist
- Texture—gypsiferous sand, gypsiferous loamy sand, or gypsiferous coarse sandy loam
- Clay content—0 to 8 percent
- Salinity—very slightly saline or slightly saline
- Gypsum content—80 to 95 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 4 inches (Ayy horizon)
- Gypsic horizon—the zone from 4 to 19.5 inches (Byy1 and Byy2 horizons)

**Description of the Lark Soil**

*Taxonomic classification:* Hypergypsic, thermic Typic Torripsamments  
*Geomorphic position:* Vegetated parabolic dunes  
*Parent material:* Gypsiferous eolian sands  
*Slope:* 5 to 35 percent
Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—15 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—18 percent
- woody debris—10 percent
- bare soil—65 percent
- rock fragments—0 percent

Drainage class: Excessively drained

$K_{sat}$ (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)

Available water capacity (total inches): 5.5 (moderate)

Shrink-swell potential: About 0.2 LEP (low)

Flooding hazard: None

Runoff class: Negligible

Hydrologic group: A

Ecological site name: Vegetated Gypsum Dunes

Ecological site number: R042XB003NM

Present vegetation: Gypsum grama, sand sagebrush, and ephedra

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 14)

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 0.15 second N. and long. 106 degrees 10 minutes 0.34 second W.

Cyy1—0 to 12 inches (0 to 30 centimeters); white (10YR 8/1) gypsiferous sand, very pale brown (10YR 7/4) moist; single grain; loose, loose, nonsticky, nonplastic; few medium and many very fine and fine roots throughout; many fine irregular gypsum crystals throughout; noneffervescent, 96 percent gypsum; neutral, pH 7.3; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; diffuse smooth boundary.

Cyy2—12 to 27.5 inches (30 to 70 centimeters); white (10YR 8/1) gypsiferous sand, very pale brown (10YR 8/3) moist; single grain; loose, loose, nonsticky, nonplastic; few medium and coarse and common very fine and fine roots throughout; many fine irregular gypsum crystals throughout; noneffervescent, 94 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 2.5 dS/m (mmhos/cm); very slightly saline; diffuse smooth boundary.

Cyy3—27.5 to 51 inches (70 to 130 centimeters); white (10YR 8/1) gypsiferous sand, very pale brown (10YR 8/2) moist; single grain; loose, loose, nonsticky, nonplastic; few very fine, fine, medium, and coarse roots throughout; many fine irregular gypsum crystals throughout; noneffervescent, 93 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.0 dS/m (mmhos/cm); very slightly saline; diffuse smooth boundary.

Cyy4—51 to 78.5 inches (130 to 200 centimeters); white (10YR 8/1) gypsiferous sand, very pale brown (10YR 8/3) moist; single grain; loose, loose, nonsticky, nonplastic; few very fine, fine, medium, and coarse roots throughout; many fine irregular gypsum crystals throughout; noneffervescent, 97 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 3.7 dS/m (mmhos/cm); very slightly saline.
Range in Characteristics

Clay content of control section (weighted average): 0 to 5 percent

Cyy horizons:
- Hue—10YR or 2.5Y
- Value—7 to 9.5 dry; 6 to 8.5 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sand or gypsiferous loamy sand
- Clay content—0 to 5 percent
- Reaction—neutral or slightly alkaline
- Gypsum content—90 to 100 percent

Figure 14.—Representative profile of the Lark soil in map unit 9 (Astrobee-Lark association, 0 to 35 percent slopes). Scale is in centimeters.
10—Astrobee-Lark-Nasa complex, 0 to 20 percent slopes

Map Unit Setting

Landform(s): Dunes and interdunes (fig. 15)
Elevation: 3,890 to 4,110 feet (1,187 to 1,252 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Astrobee and similar soils: 35 percent
Lark and similar soils: 35 percent
Nasa and similar soils: 15 percent
Minor components: 15 percent
  Leptic Haplogypsids with a fine-gypseous particle-size class and similar soils
  Yesum and similar soils
  Duneland
  Gullied land

Description of the Astrobee Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: Stabilized, cryptogamic covered interdunes
Parent material: Gypsiferous eolian sands
Slope: 0 to 5 percent

Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—20 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—5 percent
- Physical cover:
  - canopy plant cover—15 percent
  - woody debris—0 percent
  - bare soil—65 percent
  - rock fragments—0 percent

Drainage class: Excessively drained

\[ K_{sat} \text{ (solum): } 1.98 \text{ to } 19.98 \text{ inches per hour (14.00 to 141.00 micrometers per second)} \]

Available water capacity (total inches): 3.9 (low)

Shrink-swell potential: About 1.1 LEP (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Very low

Hydrologic group: A

Ecological site name: Gyp Interdune (Dry)

Ecological site number: R042XB005NM

Present vegetation: Alkali sacaton, coldenia, fourwing saltbush, gyp dropseed, gyp grama, gypsum moonpod, Torrey ephedra, and woolly paperflower

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 44 minutes 2.10 seconds N. and long. 106 degrees 20 minutes 42.50 seconds W.

Ay—0 to 1 inch (0 to 2 centimeters); light gray (10YR 7/2) gypsiferous sandy loam, brown (10YR 5/3) moist; 10 percent clay; weak thin platy structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; many very fine vesicular pores; finely disseminated carbonate and gypsum throughout; strongly effervescent, 5 percent calcium carbonate equivalent and 69 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline; abrupt smooth boundary.

Byy—1 to 7 inches (2 to 18 centimeters); very pale brown (10YR 7/3) gypsiferous sandy loam, brown (10YR 5/3) moist; 8 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; many very fine irregular pores; finely disseminated carbonate and gypsum and many fine irregular gypsum crystals throughout; strongly effervescent, 5 percent calcium carbonate equivalent and 78 percent gypsum; slightly alkaline, pH 7.5; electrical conductivity of 4.6 dS/m (mmhos/cm); slightly saline; clear smooth boundary.

Cyy—7 to 60 inches (18 to 152 centimeters); very pale brown (10YR 8/3) gypsiferous sand, very pale brown (10YR 8/2) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine roots throughout; many very fine irregular pores; finely disseminated gypsum and many fine irregular gypsum crystals throughout; noneffervescent, 0 percent calcium carbonate equivalent and 82 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 4.8 dS/m (mmhos/cm); slightly saline.
Range in Characteristics

Clay content of control section (weighted average): 0 to 8 percent

*Ay horizon:*
- Hue—10YR or 2.5Y
- Value—5 to 8 dry; 4 to 7 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand, gypsiferous fine sand, gypsiferous loamy sand, gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous loam
- Clay content—0 to 18 percent
- Calcium carbonate equivalent—0 to 5 percent
- Gypsum content—40 to 85 percent
- Reaction—slightly alkaline or moderately alkaline

*Byy horizon:*
- Hue—10YR or 2.5Y
- Value—6 to 9 dry; 5 to 8 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous loamy sand, gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous loam
- Clay content—5 to 18 percent
- Calcium carbonate equivalent—0 to 5 percent
- Gypsum content—40 to 85 percent
- Reaction—slightly alkaline or moderately alkaline

*Cyy horizon:*
- Hue—10YR or 2.5Y
- Value—6 to 9.5 dry; 5 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand, gypsiferous fine sand, gypsiferous loamy sand, or gypsiferous loamy fine sand
- Clay content—0 to 8 percent
- Calcium carbonate equivalent—0 to 2 percent
- Gypsum content—40 to 95 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 1 inch (Ay horizon)
- Gypsic horizon—the zone from 1 to 7 inches (Byy horizon)

Description of the Lark Soil

*Taxonomic classification:* Hypergypsic, thermic Typic Torripsamments
*Geomorphic position:* Vegetated parabolic dunes
*Parent material:* Gypsiferous eolian sands
*Slope:* 3 to 20 percent

Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—15 percent
woody debris—0 percent
bare soil—95 percent
rock fragments—0 percent

Drainage class: Excessively drained

K\textsubscript{sat} (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

Available water capacity (total inches): 3.0 (low)

Shrink-swell potential: About 0.6 LEP (low)

Flooding hazard: None
Ponding hazard: None
Runoff class: Negligible

Hydrologic group: A

Ecological site name: Vegetated Gypsum Dunes
Ecological site number: R042XB003NM

Present vegetation: Fourwing saltbush, gyp grama, rosemary mint, sandhill muhly, soaptree yucca, and Torrey ephedra

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 42 minutes 51.90 seconds N. and long. 106 degrees 20 minutes 32.20 seconds W.

Cyy1—0 to 2 inches (0 to 5 centimeters); white (10YR 8.5/1) gypsiferous sand, light brownish gray (10YR 6/2) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; many medium interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent and 79 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline; clear smooth boundary.

Cyy2—2 to 60 inches (5 to 152 centimeters); white (10YR 9.5/1) gypsiferous coarse sand, light gray (10YR 7/2) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; many medium interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent and 82 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 5.0 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 5 percent

Cyy horizons:
Hue—10YR or 2.5Y
Value—7 to 9.5 dry; 6 to 9 moist
Chroma—1 to 3, dry or moist
Texture—gypsiferous coarse sand, gypsiferous sand, gypsiferous fine sand, gypsiferous loamy sand, or gypsiferous loamy fine sand
Clay content—0 to 5 percent
Gypsum content—70 to 90 percent
Reaction—slightly alkaline or moderately alkaline

Description of the Nasa Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Typic Petrogypsids

Geomorphic position: Cryptogamic covered parabolic dunes

Parent material: Gypsiferous eolian sands

Slope: 0 to 8 percent

Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—20 percent

Chemical crust:
salt—0 percent
gypsum—0 percent

Physical cover:
canopy plant cover—40 percent
woody debris—0 percent
bare soil—60 percent
rock fragments—0 percent

Depth to restrictive feature(s): 23.5 to 37.5 inches to petrogypsic horizon

Drainage class: Somewhat excessively drained

$K_{sat}$ (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

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

Shrink-swell potential: About 1.4 LEP (low)

Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: B

Ecological site name: Gyp Outcrop
Ecological site number: R042XB007NM

Present vegetation: Coldenia, fourwing saltbush, gyp dropseed, honey mesquite, jimmyweed, and Torrey ephedra

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 43 minutes 58.60 seconds N. and long. 106 degrees 22 minutes 58.50 seconds W.

Ayy—0 to 2.5 inches (0 to 6 centimeters); light gray (10YR 7/2) gypsiferous loamy sand, light yellowish brown (10YR 6/4) moist; 5 percent clay; weak thin platy structure; soft, very friable, nonsticky, nonplastic; common very fine and common fine roots throughout; many very fine irregular pores; finely disseminated carbonate and gypsum throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 72 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 4.8 dS/m (mmhos/cm); slightly saline; clear smooth boundary.

Byy1—2.5 to 9 inches (6 to 23 centimeters); very pale brown (10YR 7/3) gypsiferous loamy sand, yellowish brown (10YR 5/4) moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and common fine roots throughout; many very fine irregular pores; finely disseminated carbonate and gypsum and common medium irregular gypsum masses throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 74 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline; clear smooth boundary.

Byy2—9 to 33 inches (23 to 84 centimeters); very pale brown (10YR 8/3) gypsiferous sandy loam, very pale brown (10YR 7/4) moist; 12 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine irregular pores; finely disseminated carbonate and gypsum and common coarse irregular gypsum crystals throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 81 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 6.2 dS/m (mmhos/cm); slightly saline; gradual smooth boundary.
Byy3—33 to 37 inches (84 to 94 centimeters); pink (7.5YR 7/4) gypsiferous loam, light brown (7.5YR 6/4) moist; 22 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; slightly hard, very friable, moderately sticky, moderately plastic; many very fine irregular pores; finely disseminated carbonate and gypsum and common fine and common medium irregular gypsum masses throughout; strongly effervescent, 7 percent calcium carbonate equivalent and 72 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 6.6 dS/m (mmhos/cm); slightly saline; abrupt smooth boundary.

Byym—37 to 60 inches (94 to 152 centimeters); pink (7.5YR 7/4) very strongly cemented material, light brown (7.5YR 6/4) moist; noneffervescent, 0 percent calcium carbonate equivalent and 73 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 6.7 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 8 to 25 percent

Ayy horizon:
- Hue—10YR or 2.5Y
- Value—6 to 9 dry; 5 to 8.5 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sand, gypsiferous fine sand, gypsiferous loamy sand, gypsiferous loamy fine sand, gypsiferous fine sandy loam, or gypsiferous sandy loam
- Clay content—0 to 18 percent
- Calcium carbonate equivalent—0 to 2 percent
- Gypsum content—40 to 90 percent
- Reaction—slightly alkaline or moderately alkaline

Byy horizons:
- Hue—7.5YR, 10YR, or 2.5Y
- Value—6 to 9 dry; 5 to 8.5 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sand, gypsiferous fine sand, gypsiferous loamy fine sand, gypsiferous fine sandy loam, gypsiferous sandy loam, or gypsiferous loam
- Clay content—2 to 25 percent
- Calcium carbonate equivalent—0 to 8 percent
- Gypsum content—40 to 90 percent
- Reaction—slightly alkaline or moderately alkaline

Byym horizon:
- Hardness—strongly cemented or very strongly cemented
- Thickness—5 to 40 inches; laterally discontinuous

Diagnostic Features
- Ochric epipedon—the zone from 0 to 2.5 inches (Ayy horizon)
- Gypsic horizon—the zone from 2.5 to 37 inches (Byy1, Byy2, and Byy3 horizons)
- Petrogypsic horizon—the zone from 37 to 60 inches (Byym horizon)

11—Bigsalt-Najul complex, 0 to 3 percent slopes

Map Unit Setting

Landform(s): Alluvial flats (fig. 16)
Elevation: 3,900 to 4,020 feet (1,190 to 1,224 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Bigsalt and similar soils: 80 percent
Najul and similar soils: 15 percent
Minor components: 5 percent
  Gypsic Aquisalids and similar soils
  Petrogypsic Haplosalids and similar soils
  Terrier and similar soils
  Ybar and similar soils

Description of the Bigsalt Soil

Taxonomic classification: Fine, gypsic, thermic Gypsic Haplosalids
Geomorphic position: Broad bare areas of alluvial flats and flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent

Figure 16.—An area of map unit 11 (Bigsalt-Najul complex, 0 to 3 percent slopes), looking down from an area of map unit 53 (Matador family gypsiferous sand, 5 to 90 percent slopes).
Chemical crust:
- salt—5 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—0 percent
- woody debris—0 percent
- bare soil—95 percent
- rock fragments—0 percent

Depth to restrictive feature(s): 0 to 2 inches to salic horizon

Drainage class: Well drained

$K_{sat}$ (solum): 0.06 to 0.57 inch per hour (0.42 micrometer to 4.00 micrometers per second)

Available water capacity (total inches): 0.0 (very low)

Shrink-swell potential: About 4.1 LEP (moderate)

Flooding hazard: Occasional

Depth to seasonal high water table (minimum): About 60 to 79 inches

Runoff class: Negligible

Hydrologic group: C

Ecological site name: Salty Bottomland

Ecological site number: R042XB033NM

Present vegetation: Bare ground

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 3 minutes 34.10 seconds N. and long. 106 degrees 29 minutes 42.40 seconds W.

Anz—0 to 6 inches (0 to 15 centimeters); light reddish brown (5YR 6/4) silty clay, reddish brown (5YR 4/3) moist; 45 percent clay; strong thick platy over strong coarse subangular blocky structure; very hard, very firm, very sticky, very plastic; finely disseminated carbonate and gypsum and common very fine irregular salt crystals throughout; violently effervescent, 22 percent calcium carbonate equivalent and 12 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 30.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Bnz—6 to 27.5 inches (15 to 70 centimeters); reddish brown (5YR 5/4) gypsiferous silty clay loam, reddish brown (5YR 4/3) moist; 38 percent clay; moderate medium subangular blocky structure; moderately hard, friable, moderately sticky, moderately plastic; finely disseminated carbonate and gypsum and common very fine irregular salt crystals throughout; violently effervescent, 16 percent calcium carbonate equivalent and 22 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 33.0 dS/m (mmhos/cm); strongly saline; gradual wavy boundary.

Byz—27.5 to 39.5 inches (70 to 100 centimeters); light reddish brown (5YR 6/4) gypsiferous clay, reddish brown (5YR 4/4) moist; 44 percent clay; weak coarse subangular blocky structure; moderately hard, friable, moderately sticky, moderately plastic; finely disseminated carbonate, common medium irregular gypsum crystal clusters, and common very fine irregular salt crystals throughout; strongly effervescent, 11 percent calcium carbonate equivalent and 35 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 28.0 dS/m (mmhos/cm); strongly saline; diffuse wavy boundary.

Bnyz1—39.5 to 51 inches (100 to 130 centimeters); light reddish brown (5YR 6/4) gypsiferous clay, reddish brown (5YR 4/4) moist; 48 percent clay; weak coarse subangular blocky structure; hard, very firm, moderately sticky, very plastic; finely disseminated carbonate, common medium irregular gypsum crystal clusters,
common coarse irregular gypsum crystals, and common very fine irregular salt crystals throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 28 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 46.0 dS/m (mmhos/cm); strongly saline; gradual wavy boundary.  

Bnyz2—51 to 60 inches (130 to 152 centimeters); light reddish brown (5YR 6/4) clay, reddish brown (5YR 4/4) moist; 42 percent clay; weak coarse subangular blocky structure; moderately hard, firm, moderately sticky, very plastic; finely disseminated carbonate, common medium irregular gypsum crystal clusters, common coarse irregular gypsum crystals, and common very fine irregular salt crystals throughout; violently effervescent, 17 percent calcium carbonate equivalent and 14 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 36.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 35 to 60 percent

Anz horizon:  
Hue—5YR to 10YR  
Value—4 to 6 dry; 3 to 5 moist  
Chroma—3 to 4, dry or moist  
Texture—gypsiferous loamy sand, loamy sand, gypsiferous loam, loam, silt loam, silty clay loam, or silty clay  
Clay content—8 to 45 percent  
Salinity—moderately saline or strongly saline

Bnz horizon:  
Hue—5YR to 10YR  
Value—4 to 6 dry; 3 to 5 moist  
Chroma—3 to 4, dry or moist  
Texture—gypsiferous silty clay loam, gypsiferous silty clay, or gypsiferous clay  
Clay content—35 to 60 percent

Byz and Bnyz horizons:  
Hue—5YR to 10YR  
Value—4 to 6 dry; 3 to 5 moist  
Chroma—3 to 4, dry or moist  
Texture—gypsiferous clay loam, gypsiferous silty clay loam, gypsiferous silty clay, clay, or gypsiferous clay  
Clay content—35 to 60 percent  
Gypsum content—14 to 40 percent

Diagnostic Features

• Ochric epipedon—the zone from 0 to 7 inches (Anz and Bnz horizons)  
• Gypsic horizon—the zone from 27.5 to 60 inches (Byz, Bnyz1, and Bnyz2 horizons)  
• Salic horizon—the zone from 0 to 60 inches (Anz, Bnz, Byz, Bnyz1, and Bnyz2 horizons)

Description of the Najul Soil

Taxonomic classification: Fine, gypsic, thermic Leptic Haplogypsids  
Geomorphic position: Slightly raised areas of alluvial flats and broad flood plains  
Parent material: Clayey alluvium  
Slope: 0 to 3 percent  
Surface cover  
  Biological crust:  
    cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent

Chemical crust:
salt—0 percent
gypsum—0 percent

Physical cover:
canopy plant cover—40 percent
woody debris—15 percent
bare soil—50 percent
rock fragments—0 percent

Drainage class: Well drained

\[ K_{sat} \text{ (solum): } 0.06 \text{ to } 0.57 \text{ inch per hour (0.42 micrometer to 4.00 micrometers per second)} \]

Available water capacity (total inches): 9.2 (high)

Shrink-swell potential: About 3.7 LEP (moderate)

Flooding hazard: Rare

Depth to seasonal high water table (minimum): About 60 to 79 inches

Runoff class: Negligible

Hydrologic group: C

Ecological site name: Salty Bottomland

Ecological site number: R042XB033NM

Present vegetation: Alkali sacaton, honey mesquite, fourwing saltbush, iodinebush, desert seepweed, pickleweed, and tamarisk

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 3 minutes 20.00 seconds N. and long. 106 degrees 30 minutes 5.00 seconds W.

Ayz—0 to 6 inches (0 to 15 centimeters); reddish brown (5YR 5/3) silty clay loam, dark reddish brown (5YR 3/3) moist; 38 percent clay; moderate medium platy over moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common medium and few fine roots throughout; common medium dendritic tubular pores; finely disseminated carbonate and common medium threadlike gypsum crystal clusters throughout; violently effervescent, 21 percent calcium carbonate equivalent and 11 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 20.2 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

Byz1—6 to 21.5 inches (15 to 55 centimeters); reddish brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; 42 percent clay; moderate medium and strong coarse subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few fine roots throughout; few medium dendritic tubular pores; finely disseminated carbonate and common medium threadlike gypsum crystal clusters throughout; violently effervescent, 19 percent calcium carbonate equivalent and 8 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 10.3 dS/m (mmhos/cm); moderately saline; diffuse wavy boundary.

Byz2—21.5 to 35.5 inches (55 to 90 centimeters); light reddish brown (5YR 6/4) gypsiferous silty clay, reddish brown (5YR 4/4) moist; 45 percent clay; strong coarse subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; finely disseminated carbonate, common medium irregular gypsum crystal clusters, and common medium irregular gypsum crystals throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 43
percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 10.6 dS/m (mmhos/cm); moderately saline; gradual smooth boundary.

Byz3—35.5 to 60 inches (90 to 152 centimeters); light reddish brown (5YR 6/4) gypsiferous clay, reddish brown (5YR 5/4) moist; 50 percent clay; strong coarse subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; finely disseminated carbonate and common medium irregular gypsum crystal clusters throughout; violently effervescent, 13 percent calcium carbonate equivalent and 28 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 22.3 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 35 to 60 percent

Ayz horizon:
Hue—5YR or 7.5YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—silty clay loam or silty clay
Clay content—27 to 50 percent
Gypsum content—5 to 20 percent
Salinity—moderately saline or strongly saline

Byz horizons:
Hue—5YR or 7.5YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—gypsiferous clay loam, gypsiferous silty clay loam, silty clay, gypsiferous silty clay, or gypsiferous clay
Clay content—35 to 60 percent
Gypsum content—5 to 50 percent; average of less than 40 percent
Salinity—moderately saline or strongly saline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 6 inches (Ayz horizon)
• Gypsic horizon—the zone from 6 to 60 inches (Byz1, Byz2, and Byz3 horizons)

12—Bissett-Rock outcrop complex, 5 to 25 percent slopes

Map Unit Setting

Landform(s): Hills and ridges (fig. 17)
Elevation: 4,260 to 6,880 feet (1,298 to 2,097 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 61 to 64 degrees F (16.0 to 18.0 degrees C)
Mean annual soil temperature: 63 to 66 degrees F (17.1 to 19.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-3 Chihuahuan Desert Grassland

Map Unit Composition

Bissett and similar soils: 60 percent
Rock outcrop: 35 percent
Minor components: 5 percent
Chilicotal and similar soils
Monterosa and similar soils
Riverwash

**Description of the Bissett Soil**

*Taxonomic classification:* Loamy-skeletal, carbonatic, thermic Lithic Ustic Haplocalcids
*Geomorphic position:* Summits, shoulders, and backslopes of limestone hills
*Parent material:* Gravelly colluvium derived from limestone
*Slope:* 5 to 25 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—25 percent
  - woody debris—5 percent
  - bare soil—5 percent
  - rock fragments—65 percent gravel, 20 percent cobbles, and 5 percent stones

*Depth to restrictive feature(s):* 10 to 18 inches to lithic bedrock
*Drainage class:* Well drained

- $K_{sat}$ (*solum*): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
- $K_{sat}$ (*restrictive layer*): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)
Available water capacity (total inches): 1.1 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Runoff class: Very high
Hydrologic group: D
Ecological site name: Limestone Hills
Ecological site number: R042XC020NM
Present vegetation: Blue grama, creosotebush, mariola, snakeweed, and threeawn
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 31 minutes 38.70 seconds N. and long. 106 degrees 26 minutes 7.70 seconds W.

A—0 to 1 inch (0 to 3 centimeters); brown (7.5Y 5/3) very gravelly sandy loam, brown (7.5YR 4/3) moist; 16 percent clay; moderate fine subangular blocky and moderate fine granular structure; soft, very friable, nonsticky, nonplastic; finely disseminated carbonate throughout; 40 percent gravel; violently effervescent, 26 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk1—1 to 6.5 inches (3 to 17 centimeters); light brown (7.5Y 6/3) very cobbly sandy clay loam, brown (7.5YR 4/4) moist; 22 percent clay; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few fine tubular pores; finely disseminated carbonate and common fine irregular carbonate masses throughout; 40 percent gravel and 18 percent cobbles; violently effervescent, 50 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk2—6.5 to 14 inches (17 to 35 centimeters); pink (7.5Y 7/3) very cobbly sandy clay loam, light brown (7.5YR 6/3) moist; 24 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; few fine tubular pores; common fine irregular carbonate masses and common medium irregular carbonate nodules throughout; 40 percent gravel and 10 percent cobbles; violently effervescent, 52 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.

R—14 inches (35 centimeters); unweathered, unfractured limestone.

Range in Characteristics

Clay content of control section (weighted average): 15 to 24 percent
Rock fragment content in control section: 20 to 75 percent; average of more than 35 percent
Other characteristics: Some pedons have a thin Cr horizon; some pedons have a Bw horizon

A horizon:
Hue—7.5YR or 10YR
Value—5 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, loam, or sandy clay loam
Clay content—15 to 22 percent
Rock fragment content—27 to 50 percent
Calcium carbonate equivalent—14 to 26 percent

Bk horizons:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 to 6 moist  
Chroma—2 to 4, dry or moist  
Texture—sandy loam, fine sandy loam, loam, or sandy clay loam  
Clay content—15 to 24 percent  
Rock fragment content—20 to 75 percent  
Calcium carbonate equivalent—24 to 52 percent; average of more than 40 percent

**Diagnostic Features**  
- Ochric epipedon—the zone from 0 to 1 inch (A horizon)  
- Calcic horizon—the zone from 1 to 14 inches (Bk1 and Bk2 horizons)  
- Depth to lithic contact—14 inches (R horizon)

**Description of Rock Outcrop**  
This component consists of exposures of steep, flat, or rolling bedrock and cliffs. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

**13—Bissett-Rock outcrop complex, 25 to 90 percent slopes**

**Map Unit Setting**

*Landform(s):* Mountains (fig. 18)  
*Elevation:* 4,340 to 8,230 feet (1,324 to 2,508 meters)  
*Mean annual precipitation:* 12 to 14 inches (305 to 356 millimeters)  
*Mean annual air temperature:* 61 to 64 degrees F (16.0 to 18.0 degrees C)  
*Mean annual soil temperature:* 63 to 66 degrees F (17.1 to 19.1 degrees C)  
*Frost-free period:* 180 to 240 days  
*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains  
*Land Resource Unit:* 42-3 Chihuahuan Desert Grassland

**Map Unit Composition**

Bissett and similar soils: 70 percent  
Rock outcrop: 25 percent  
Minor components: 5 percent  
- Chilicotal and similar soils  
- Monterosa and similar soils  
- Ustic Haplocalcids and similar soils  
- Riverwash

**Description of the Bissett Soil**

*Taxonomic classification:* Loamy-skeletal, carbonatic, thermic Lithic Ustic Haplocalcids  
*Geomorphic position:* All positions of limestone mountains  
*Parent material:* Gravelly colluvium derived from limestone  
*Slope:* 25 to 90 percent  
*Surface cover*  
- Biological crust:  
  - cyanobacteria—0 percent  
  - lichen—0 percent  
  - moss—0 percent  
  - cryptogamic crust—0 percent  
- Chemical crust:  
  - salt—0 percent  
  - gypsum—0 percent
Physical cover:
  canopy plant cover—55 percent
  woody debris—0 percent
  bare soil—0 percent
  rock fragments—80 percent gravel, 15 percent cobbles, and 5 percent stones

Depth to restrictive feature(s): 4 to 19.5 inches to lithic bedrock

Drainage class: Well drained

$K_{sat}$ (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)
$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

Available water capacity (total inches): 0.8 (very low)

Shrink-swell potential: About 1.4 LEP (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: High

Hydrologic group: D

Ecological site name: Limestone Hills

Ecological site number: R042XC020NM

Present vegetation: Black grama, blue grama, cactus, creosote bush, mariola, ocotillo, and sotol

Land capability classification (nonirrigated areas): 6c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 33 degrees 24 minutes 25.50 seconds N. and long. 106 degrees 32 minutes 2.80 seconds W.

A—0 to 2 inches (0 to 5 centimeters); brown (7.5YR 5/4) very gravelly sandy loam, dark brown (7.5YR 3/4) moist; 15 percent clay; weak medium subangular blocky
structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots throughout; common medium tubular pores; finely disseminated carbonate throughout; 5 percent cobbles and 40 percent gravel; violently effervescent, 14 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; diffuse wavy boundary.

Bk—2 to 10 inches (5 to 25 centimeters); brown (7.5YR 5/4) very gravelly sandy clay loam, brown (7.5YR 4/4) moist; 25 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common fine and coarse roots throughout; common carbonate coats on rock fragments; finely disseminated carbonate throughout and common fine irregular carbonate masses in matrix; 10 percent cobbles and 45 percent gravel; violently effervescent, 24 percent calcium carbonate equivalent; slightly alkaline, pH 7.5; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.

R—10 inches (25 centimeters); unweathered, unfractured limestone.

Range in Characteristics

Note: The Bissett series classifies within the carbonatic mineralogy family. By definition, the soil must have 40 percent (by mass) calcium carbonate in its mineral content up to particles 20 millimeters in diameter. As described below, it only has a maximum of 40 percent. The discrepancy can be explained by the inclusion of the 2- to 20-millimeter sieve size in the determination of taxonomic family class; only the 2-millimeter and finer fraction is used for the map unit description. When the 2- to 20-millimeter fraction is included in the analysis, the Bissett soil has upwards of 50 to 60 percent calcium carbonate.

Clay content of control section (weighted average): 10 to 27 percent
Rock fragment content in control section: 35 to 65 percent
Calcium carbonate equivalent of control section (fraction less than 20 mm): Average of more than 40 percent

A horizon:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 3 to 6 moist
Chroma—3 to 4, dry or moist
Texture—sandy loam or loam
Clay content—12 to 25 percent
Rock fragment content—5 to 55 percent
Reaction—slightly alkaline or moderately alkaline

Bk horizon:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 3 to 6 moist
Chroma—3 to 4, dry or moist
Texture—loam or sandy clay loam
Clay content—20 to 30 percent
Rock fragment content—35 to 65 percent
Calcium carbonate equivalent (fine-earth fraction)—15 to 40 percent
Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 2 inches (A horizon)
• Calcic horizon— the zone from 2 to 10 inches (Bk horizon)
• Depth to lithic contact—10 to 19.5 inches
Description of Rock Outcrop

This component consists of exposures of flat, steep, or rolling bedrock and cliffs. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

14—Bodecker-Riverwash complex, 0 to 20 percent slopes

Map Unit Setting

Landform(s): Channels and drainageways (fig. 19)
Elevation: 4,080 to 7,230 feet (1,245 to 2,204 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 61 to 64 degrees F (16.0 to 18.0 degrees C)
Mean annual soil temperature: 63 to 66 degrees F (17.1 to 19.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-3 Chihuahuan Desert Grassland

Map Unit Composition

Bodecker and similar soils: 60 percent
Riverwash: 35 percent
Minor components: 5 percent
- Bissett and similar soils
- Chilicotal and similar soils
- Deama and similar soils
- Ustic Torrifluvents with a loamy-skeletal particle-size class and similar soils
- Gullied land

Description of the Bodecker Soil

Taxonomic classification: Sandy-skeletal, mixed, thermic Ustic Torrifluvents
Geomorphic position: Drainageways
Parent material: Sandy and gravelly alluvium  
Slope: 0 to 8 percent  
Surface cover  
  Biological crust:  
    cyanobacteria—0 percent  
    lichen—0 percent  
    moss—0 percent  
    cryptogamic crust—0 percent  
Chemical crust:  
    salt—0 percent  
    gypsum—0 percent  
Physical cover:  
  canopy plant cover—35 percent  
  woody debris—2 percent  
  bare soil—0 percent  
  rock fragments—60 percent gravel, 30 percent cobbles, 5 percent stones, and 2 percent boulders  
Drainage class: Excessively drained  
$K_{\text{sat}}$ (solum): 5.95 to 99.92 inches per hour (42.00 to 705.00 micrometers per second)  
Available water capacity (total inches): 1.4 (very low)  
Shrink-swell potential: About 0.2 LEP (low)  
Flooding hazard: Occasional  
Runoff class: Very low  
Hydrologic group: A  
Ecological site name: Draw  
Ecological site number: R042XC008NM  
Present vegetation: Blue grama, desert willow, juniper, mountain mahogany, pinyon, and walkingstick cactus  
Land capability classification (nonirrigated areas): 6c  

Typical Pedon  

Location by Geographic Coordinate System: lat. 33 degrees 11 minutes 2.30 seconds N. and long. 106 degrees 38 minutes 44.50 seconds W.  

C1—0 to 2.5 inches (0 to 6 centimeters); brown (7.5YR 5/3) extremely cobbly loamy coarse sand, brown (7.5YR 4/3) moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine and fine roots throughout; many fine interstitial pores; finely disseminated carbonate throughout; 50 percent gravel, 25 percent cobbles, 5 percent stones, and 2 percent boulders; strongly effervescent, 15 percent calcium carbonate equivalent; slightly alkaline, pH 7.5; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.  

C2—2.5 to 13.5 inches (6 to 34 centimeters); brown (7.5YR 5/3) extremely cobbly coarse sandy loam, brown (7.5YR 4/3) moist; 12 percent clay; massive; soft, very friable, slightly sticky, nonplastic; few very fine and few fine roots throughout; many fine interstitial pores; finely disseminated carbonate throughout; 35 percent gravel, 35 percent cobbles, 5 percent stones, and 5 percent boulders; strongly effervescent, 20 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.  

C3—13.5 to 60 inches (34 to 152 centimeters); brown (7.5YR 5/3) extremely stony coarse sand, brown (7.5YR 4/3) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine and fine roots throughout; many fine interstitial pores; finely disseminated carbonate throughout; 45 percent gravel, 20 percent cobbles, 10 percent stones, and 5 percent boulders; strongly effervescent,
13 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 2 to 6 percent
Rock fragment content in control section: 60 to 90 percent

C horizons:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 4 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—coarse sand, loamy coarse sand, loamy sand, or coarse sandy loam
- Clay content—2 to 18 percent; average of less than 6 percent
- Rock fragment content—60 to 90 percent

Description of Riverwash

Riverwash is very deep, excessively drained, stratified material consisting of unstabilized sandy, silty, clayey, and/or gravelly sediment that is part of a dynamic inter-braided system of bars and channels. This material is not stable and is subject to shifting and sorting. It is usually dry but can be transformed into a temporary water course or a short-lived torrent after large amounts of precipitation or excessive runoff within the watershed. Vegetation is usually not supported due to the constant scouring and shifting of sediments.

15—Brazito fine sand, 0 to 20 percent slopes

Map Unit Setting

Landform(s): Dunes (fig. 20)
Elevation: 4,520 to 5,540 feet (1,379 to 1,689 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Brazito and similar soils: 85 percent
Minor components: 15 percent
- Lithic Haplargids and similar soils
- Pajarito and similar soils
- Tonuco and similar soils
- Wink and similar soils
- Duneland

Description of the Brazito Soil

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Rolling dune fields, sand sheets, and shrub-coppice dunes
Parent material: Eolian sands
Slope: 0 to 20 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent
Chemical crust:
salt—0 percent
gypsum—0 percent
Physical cover:
canopy plant cover—45 percent
woody debris—10 percent
bare soil—60 percent
rock fragments—0 percent

Drainage class: Excessively drained
$K_{sat}$ (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)
Available water capacity (total inches): 4.2 (low)
Shrink-swell potential: About 0.1 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: A
Ecological site name: Deep Sand
Ecological site number: R042XB011NM
Present vegetation: Giant dropseed, mesa dropseed, spike dropseed, sand sagebrush, mesquite, and cactus
Land capability classification (nonirrigated areas): 7c

**Typical Pedon**

*Location by Geographic Coordinate System*: lat. 33 degrees 46 minutes 39.00 seconds N. and long. 106 degrees 44 minutes 42.40 seconds W.

C1—0 to 3 inches (0 to 8 centimeters); brown (7.5YR 5/3) fine sand, weak red (7.5R 4/4) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium and common fine roots throughout; common fine interstitial pores; noneffervescent; slightly alkaline, pH 7.8; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.
C2—3 to 60 inches (8 to 152 centimeters); brown (7.5YR 5/3) fine sand, weak red (7.5R 4/4) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; common fine interstitial pores; noneffervescent; moderately alkaline, pH 7.9; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 5 percent

C horizons:
Hue—7.5YR
Value—4 to 5 dry; 3 to 4 moist
Chroma—3 to 4, dry or moist
Texture—sand, fine sand, or loamy fine sand
Clay content—0 to 5 percent

16—Brazito-Noum complex, 0 to 9 percent slopes

Map Unit Setting

Landform(s): Dunes and interdunes
Elevation: 4,690 to 5,020 feet (1,430 to 1,530 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Brazito and similar soils: 45 percent
Noum and similar soils: 40 percent
Minor components: 15 percent
Pajarito and similar soils
Wink and similar soils
Yesum similar soils

Description of the Brazito Soil

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Siliceous sand dunes capping eolian gypsiferous material
Parent material: Eolian sands
Slope: 0 to 9 percent
Surface cover
Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
  cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—40 percent
  woody debris—10 percent
bare soil—70 percent
rock fragments—0 percent

**Drainage class:** Excessively drained

**$K_{\text{sat}}$ (solum):** 5.95 to 99.92 inches per hour (42.00 to 705.00 micrometers per second)

**Available water capacity (total inches):** 4.2 (low)

**Shrink-swell potential:** About 0.5 LEP (low)

**Floodling hazard:** None

**Runoff class:** Very low

**Hydrologic group:** A

**Ecological site name:** Deep Sand

**Ecological site number:** R042XB011NM

**Present vegetation:** Broom snakeweed, giant dropseed, mesa dropseed, other shrubs, sand sagebrush, and soaptree yucca

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 33 degrees 45 minutes 45.10 seconds N. and long. 106 degrees 34 minutes 11.10 seconds W.

**A—**0 to 1 inch (0 to 3 centimeters); light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; 6 percent clay; weak medium subangular blocky structure; loose, loose, nonsticky, nonplastic; noneffervescent; moderately alkaline, pH 8.2; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

**C—**1 to 60 inches (3 to 152 centimeters); yellowish brown (10YR 5/6) sand, yellowish brown (10YR 5/4) moist; 5 percent clay; massive; loose, loose, nonsticky, nonplastic; finely disseminated carbonate throughout; very slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

**Clay content of control section (weighted average):** 2 to 6 percent

**Other characteristics:** Some pedons do not have an A horizon with an ochric diagnostic epipedon

**A horizon:**
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—sand, fine sand, or loamy sand
- Clay content—2 to 6 percent

**C horizon:**
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—sand or loamy sand
- Clay content—2 to 6 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 1 inch (A horizon)

**Description of the Noum Soil**

**Taxonomic classification:** Loamy over coarse-gypseous, mixed over hypergypsic, superactive, thermic Typic Haplogypsids

**Geomorphic position:** Siliceous sand dunes capping eolian gypsiferous material
Parent material: Mixed eolian sands over gypsiferous eolian deposits
Slope: 0 to 5 percent
Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—5 percent
Chemical crust:
salt—0 percent
gypsum—3 percent
Physical cover:
canopy plant cover—20 percent
woody debris—5 percent
bare soil—80 percent
rock fragments—0 percent
Depth to restrictive feature(s): 8 to 16 inches to strongly contrasting textural stratification
Drainage class: Somewhat excessively drained
K$_{\text{sat}}$ (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Available water capacity (total inches): 0.9 (very low)
Shrink-swell potential: About 1.3 LEP (low)
Flooding hazard: None
Runoff class: Very low
Hydrologic group: A
Ecological site name: Sandy
Ecological site number: R042XB012NM
Present vegetation: Threeawn, black grama, bush muhly, dropseed, ephedra, sand sagebrush, and soaptree yucca
Land capability classification (nonirrigated areas): 7c

Typical Pedon
Location by Geographic Coordinate System: lat. 33 degrees 49 minutes 23.80 seconds N. and long. 106 degrees 36 minutes 37.20 seconds W.
A—0 to 1 inch (0 to 3 centimeters); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; 8 percent clay; weak very thick platy structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; finely disseminated carbonate throughout; 1 percent fine gravel; slightly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear smooth boundary.
Bw1—1 to 4 inches (3 to 10 centimeters); brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 3/4) moist; 9 percent clay; moderate medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; finely disseminated carbonate throughout; 1 percent fine gravel; strongly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline; diffuse wavy boundary.
Bw2—4 to 14 inches (10 to 35 centimeters); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/3) moist; 12 percent clay; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and few fine roots throughout; very few distinct pinkish gray (7.5YR 7/2), dry, carbonate coats on rock fragments; finely disseminated carbonate throughout; 1 percent fine gravel; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline,
pH 8.0; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; very abrupt wavy boundary.

2Byy—14 to 60 inches (35 to 152 centimeters); pink (7.5YR 7/4) gypsiferous sandy loam, light brown (7.5YR 6/4) moist; 15 percent clay; moderate coarse and medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine roots throughout; finely disseminated carbonate and many fine irregular gypsum crystals throughout; strongly effervescent, 7 percent calcium carbonate equivalent and 62 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline.

**Range in Characteristics**

**Clay content of control section (weighted average):** 5 to 18 percent

**A horizon:**
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—sand, fine sand, loamy fine sand, or sandy loam
- Clay content—4 to 10 percent
- Reaction—slightly alkaline or moderately alkaline

**Bw horizons:**
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—loamy sand, loamy fine sand, loamy very fine sand, sandy loam, or fine sandy loam
- Clay content—5 to 12 percent
- Reaction—slightly alkaline or moderately alkaline

**2Byy horizon:**
- Hue—7.5YR or 10YR
- Value—5 to 8 dry; 4 to 7 moist
- Chroma—3 to 6, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous loam, or gypsiferous silt loam
- Clay content—8 to 18 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline
- Gypsum content—50 to 80 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
- Cambic horizon—the zone from 1 to 14 inches (Bw1 and Bw2 horizons)
- Gypsic horizon—the zone from 14 to 60 inches (2Byy horizon)
- Depth to strongly contrasting particle-size class—14 inches (loamy over coarse-gypseous)

**17—Campana-Yesum complex, 0 to 10 percent slopes**

**Map Unit Setting**

*Landform(s):* Fan piedmonts (fig. 21)

*Elevation:* 4,350 to 5,810 feet (1,325 to 1,770 meters)

*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)

*Mean annual air temperature:* 64 to 70 degrees F (18.0 to 21.0 degrees C)

*Mean annual soil temperature:* 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Campana and similar soils: 47 percent
Yesum and similar soils: 38 percent
Minor components: 15 percent
  Adelino and similar soils
  Calcigypsids with a fine particle-size class and similar soils
  Calcigypsids with a loamy-skeletal particle-size class and similar soils
  Marconi and similar soils
  Prelo and similar soils
  Riverwash

Description of the Campana Soil

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Typic Calcigypsids
Geomorphic position: Fan piedmonts
Parent material: Fine-loamy alluvium over gypsiferous alluvium
Slope: 0 to 10 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
Physical cover:
  canopy plant cover—35 percent
  woody debris—10 percent
bare soil—60 percent
rock fragments—5 percent gravel

Drainage class: Well drained

$K_{\text{sat}}$ (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity (total inches): 9.6 (high)

Shrink-swell potential: About 2.6 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: C

Ecological site name: Loamy

Ecological site number: R042XB014NM

Present vegetation: Alkali sacaton, desert holly, fourwing saltbush, and soaptree yucca

Land capability classification (nonirrigated areas): 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 33 degrees 48 minutes 41.00 seconds N. and long. 106 degrees 26 minutes 18.10 seconds W.

A—0 to 3 inches (0 to 8 centimeters); yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; 18 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bw—3 to 30.5 inches (8 to 77 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 20 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; common fine and medium dendritic tubular pores; finely disseminated carbonate throughout; 3 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk—30.5 to 35.5 inches (77 to 90 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 22 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; common very fine and fine dendritic tubular pores; common fine irregular carbonate masses throughout; 2 percent gravel; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bky—35.5 to 39.5 inches (90 to 100 centimeters); pink (7.5YR 7/3) loam, light brown (7.5YR 6/4) moist; 18 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; few fine dendritic tubular pores; common medium irregular carbonate masses and common very fine irregular gypsum crystals throughout; violently effervescent, 31 percent calcium carbonate equivalent and 12 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 2.9 dS/m (mmhos/cm); very slightly saline; abrupt smooth boundary.

2Byy—39.5 to 60 inches (100 to 152 centimeters); white (7.5YR 8/1) gypsiferous loam, pinkish white (7.5YR 8/2) moist; 14 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; strongly effervescent, 9 percent calcium carbonate equivalent and 79 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline.
Range in Characteristics

Clay content of control section (weighted average): 18 to 22 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—fine sandy loam, loam, or silt loam
- Clay content—10 to 27 percent
- Reaction—slightly alkaline or moderately alkaline

Bw horizon:
- Hue—5YR or 7.5YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—loam, silt loam, sandy clay loam, or clay loam
- Clay content—15 to 35 percent
- Reaction—slightly alkaline or moderately alkaline

Bk horizon:
- Hue—5YR or 7.5YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—loam, silt loam, sandy clay loam, or clay loam
- Clay content—15 to 35 percent
- Calcium carbonate equivalent—15 to 30 percent
- Reaction—slightly alkaline or moderately alkaline

Bky horizon:
- Hue—5YR or 7.5YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—2 to 6, dry or moist
- Texture—loam, silt loam, sandy clay loam, or clay loam
- Clay content—15 to 35 percent
- Calcium carbonate equivalent—15 to 40 percent
- Gypsum content—5 to 15 percent
- Reaction—slightly alkaline or moderately alkaline

2Byy horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 8 dry; 4 to 8 moist
- Chroma—1 to 6, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous loam, or gypsiferous silt loam
- Clay content—8 to 25 percent
- Gypsum content—60 to 95 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 3 to 30.5 inches (Bw horizon)
- Calcic horizon—the zone from 30.5 to 39.5 inches (Bk and Bky horizons)
- Gypsic horizon—the zone from 35.5 to 60 inches (Bky and 2Byy horizons)

Description of the Yesum Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: Fan piedmonts
Parent material: Eolian sands over gypsiferous alluvium
Slope: 1 to 10 percent

Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—10 percent

Chemical crust:
salt—0 percent
gypsum—2 percent

Physical cover:
canopy plant cover—30 percent
woody debris—10 percent
bare soil—50 percent
rock fragments—16 percent gravel

Drainage class: Well drained

\[ K_{sat} \text{ (solum)}: 0.20 \text{ to } 0.57 \text{ inch per hour (1.40 to 4.00 micrometers per second)} \]

Available water capacity (total inches): 8.5 (high)

Shrink-swell potential: About 1.1 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: C

Ecological site name: Gyp Upland

Ecological site number: R042XB006NM

Present vegetation: Alkali sacaton, creosote bush, hairy coldenia, and muhly

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 48 minutes 47.40 seconds N. and long. 106 degrees 39 minutes 13.80 seconds W.

A—0 to 2.5 inches (0 to 6 centimeters); brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; 8 percent clay; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and few fine roots throughout; finely disseminated carbonate throughout; 14 percent gravel; very slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

2Byy1—2.5 to 24.5 inches (6 to 62 centimeters); white (10YR 9/1) gypsiferous loam, white (10YR 8/1) moist; 12 percent clay; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few very fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; very slightly effervescent, 2 percent calcium carbonate equivalent and 83 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 3.1 dS/m (mmhos/cm); very slightly saline; abrupt smooth boundary.

2Byy2—24.5 to 36 inches (62 to 92 centimeters); pink (7.5YR 7/4) gypsiferous fine sandy loam, brown (7.5YR 5/4) moist; 10 percent clay; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine dendritic tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; 8 percent gravel; very slightly effervescent, 2 percent calcium carbonate equivalent and 75 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 2.9 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

2Byy3—36 to 60 inches (92 to 152 centimeters); light brown (7.5YR 6/4) gypsiferous fine sandy loam, brown (7.5YR 5/4) moist; 10 percent clay; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; finely disseminated carbonate,
common fine irregular gypsum masses, and many very fine irregular gypsum crystals throughout; 2 percent gravel; very slightly effervescent, 1 percent calcium carbonate equivalent and 61 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 2.5 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 8 to 20 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—loamy fine sand, sandy loam, fine sandy loam, loam, or sandy clay loam
- Clay content—5 to 30 percent
- Reaction—slightly alkaline or moderately alkaline

2Byy horizons:
- Hue—7.5YR or 10YR
- Value—5 to 9 dry; 4 to 8 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous loam
- Clay content—8 to 20 percent
- Gypsum content—60 to 95 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features

- Ochric epipedon—the zone from 0 to 2.5 inches (A horizon)
- Gypsic horizon—the zone from 2.5 to 60 inches (2Byy1, 2Byy2, and 2Byy3 horizons)

18—Chilicotal-Ustic Haplocambids complex, 5 to 50 percent slopes

Map Unit Setting

Landform(s): Alluvial fans (fig. 22)
Elevation: 4,090 to 6,410 feet (1,246 to 1,954 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 61 to 64 degrees F (16.0 to 18.0 degrees C)
Mean annual soil temperature: 63 to 66 degrees F (17.1 to 19.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-3 Chihuahuan Desert Grassland

Map Unit Composition

Chilicotal and similar soils: 45 percent
Ustic Haplocambids and similar soils: 40 percent
Minor components: 15 percent
- Bissett and similar soils
- Chipotle and similar soils
- Delnorte and similar soils
- Monterosa and similar soils
- Pantak and similar soils
- Queencreek and similar soils
- Ustic Haplargids and similar soils
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

Description of the Chilicotal Soil

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

**Geomorphic position:** Dissected alluvial fans on mountain footslopes

**Parent material:** Mixed gravelly alluvium

**Slope:** 5 to 50 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—40 percent
  - woody debris—5 percent
  - bare soil—10 percent
  - rock fragments—80 percent gravel

**Drainage class:** Somewhat excessively drained

**$K_{sat}$ (solum):** 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

Figure 22.—An area of map unit 18 (Chilicotal-Ustic Haplocambids complex, 5 to 50 percent slopes).

Gullied land
Riverwash
Rock outcrop
Available water capacity (total inches): 2.9 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: A
Ecological site name: Gravelly
Ecological site number: R042XC001NM
Present vegetation: Black grama, honey mesquite, ocotillo, and sotol
Land capability classification (nonirrigated areas): 6c

Typical Pedon (fig. 23)

Location by Geographic Coordinate System: lat. 33 degrees 11 minutes 5.40 seconds N. and long. 106 degrees 38 minutes 47.50 seconds W.
A—0 to 1 inch (0 to 3 centimeters); pinkish gray (7.5YR 6/2) very gravelly sandy loam, brown (7.5YR 4/2) moist; 18 percent clay; moderate thick platy over moderate coarse granular structure; soft, friable, nonsticky, nonplastic; few very fine roots throughout; finely disseminated carbonate throughout; 40 percent gravel; violently effervescent, 16 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

Bk1—1 to 12 inches (3 to 30 centimeters); brown (7.5YR 5/2) very gravelly sandy clay loam, brown (7.5YR 4/3) moist; 22 percent clay; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; common very fine and few fine roots throughout; few fine dendritic tubular pores; many distinct carbonate coats on rock fragments; finely disseminated carbonate and common fine irregular carbonate masses throughout; 45 percent gravel; violently effervescent, 24 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk2—12 to 19 inches (30 to 48 centimeters); brown (7.5YR 5/3) extremely gravelly sandy loam, brown (7.5YR 4/3) moist; 18 percent clay; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine roots throughout; common fine interstitial pores; many distinct carbonate coats on rock fragments; finely disseminated carbonate throughout; 65 percent gravel; violently effervescent, 33 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk3—19 to 27.5 inches (48 to 70 centimeters); pinkish gray (7.5YR 7/2) extremely gravelly sandy loam, brown (7.5YR 4/2) moist; 19 percent clay; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few very fine and fine roots throughout; common fine interstitial pores; many distinct carbonate coats on rock fragments; finely disseminated carbonate throughout; 50 percent gravel and 25 percent cobbles; violently effervescent, 30 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 1.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk4—27.5 to 60 inches (70 to 152 centimeters); pinkish gray (7.5YR 6/2) extremely gravelly sandy loam, brown (7.5YR 4/3) moist; 18 percent clay; moderate medium subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; few fine roots throughout; common fine interstitial pores; many distinct carbonate coats on rock fragments; common fine irregular carbonate masses throughout; 60 percent gravel, 15 percent cobbles, and 5 percent stones; violently effervescent, 32 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 1.4 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 18 to 27 percent
Rock fragment content in control section: 35 to 80 percent

A horizon:
   Hue—7.5YR or 10YR
   Value—4 to 6 dry; 3 to 5 moist
   Chroma—2 to 4, dry or moist
   Texture—coarse sand, sand, coarse sandy loam, sandy loam, or loam
   Clay content—2 to 21 percent
   Rock fragment content—35 to 60 percent
   Calcium carbonate equivalent—15 to 40 percent

Bk horizons:
   Hue—7.5YR or 10YR
Value—5 to 7 dry; 3 to 6 moist
Chroma—2 to 4, dry or moist
Texture—coarse sandy loam, sandy loam, loam, or sandy clay loam
Clay content—18 to 35 percent; average of less than 27 percent
Rock fragment content—35 to 85 percent
Calcium carbonate equivalent—15 to 40 percent

Diagnostic Features

• Ochric epipedon—the zone from 0 to 1 inch (A horizon)
• Calcic horizon—the zone from 1 to 60 inches (Bk1, Bk2, Bk3, and Bk4 horizons)

Description of the Ustic Haplocambids

Taxonomic classification: Ustic Haplocambids
Geomorphic position: Dissected alluvial fans on mountain footslopes
Parent material: Mixed gravelly alluvium
Slope: 5 to 50 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—40 percent
    woody debris—3 percent
    bare soil—5 percent
    rock fragments—50 percent gravel, 30 percent cobbles, and 10 percent stones

Drainage class: Excessively drained
Ksat (solum): 5.95 to 99.92 inches per hour (42.00 to 705.00 micrometers per second)
Available water capacity (total inches): 1.6 (very low)
Shrink-swell potential: About 0.6 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: A
Ecological site name: Gravelly
Ecological site number: R042XC001NM
Present vegetation: Creosote bush, pricklypear, honey mesquite, and soaptree yucca
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 22 minutes 19.90 seconds N. and long. 106 degrees 25 minutes 15.40 seconds W.

A—0 to 2 inches (0 to 5 centimeters); brown (10YR 5/3) very gravelly coarse sand, brown (10YR 4/3) moist; 2 percent clay; weak very thick platy structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; many very fine interstitial pores; finely disseminated carbonate throughout; 25 percent gravel and 15 percent cobbles; slightly effervescent, 2 percent calcium carbonate equivalent; neutral, pH 7.3; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw1—2 to 12 inches (5 to 30 centimeters); brown (10YR 5/3) extremely gravelly coarse sand, brown (10YR 4/3) moist; 3 percent clay; weak fine subangular
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blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; many very fine interstitial pores; finely disseminated carbonate throughout; 60 percent gravel, 5 percent cobbles, and 2 percent stones; slightly effervescent, 3 percent calcium carbonate equivalent; neutral, pH 7.3; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw2—12 to 31.5 inches (30 to 80 centimeters); brown (10YR 5/3) very gravelly loamy sand, brown (10YR 4/3) moist; 10 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few medium and coarse roots throughout; many very fine interstitial pores; finely disseminated carbonate throughout; 35 percent gravel and 5 percent cobbles; strongly effervescent, 5 percent calcium carbonate equivalent; neutral, pH 7.2; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

C—31.5 to 60 inches (80 to 152 centimeters); brown (10YR 5/3) extremely gravelly coarse sand, brown (10YR 4/3) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many very fine interstitial pores; finely disseminated carbonate throughout; 50 percent gravel, 15 percent cobbles, and 10 percent stones; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Note: The Ustic Haplocambids have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 2 to 10 percent
Rock fragment content in control section: 35 to 90 percent

A horizon:
Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—coarse sand, coarse sandy loam, or sandy loam
Clay content—2 to 8 percent
Rock fragment content—20 to 55 percent

Bw horizons:
Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—coarse sand, loamy coarse sand, loamy sand, or coarse sandy loam
Clay content—2 to 10 percent
Rock fragment content—35 to 80 percent
Reaction—neutral or slightly alkaline

C horizon:
Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 6, dry or moist
Texture—coarse sand, loamy coarse sand, or loamy sand
Clay content—0 to 5 percent
Rock fragment content—35 to 90 percent
Reaction—neutral or slightly alkaline

Diagnostic Features

• Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
• Cambic horizon—the zone from 2 to 31.5 inches (Bw1 and Bw2 horizons)
19—Copia-Patriot complex, 0 to 15 percent slopes

Map Unit Setting

Landform(s): Dunes and interdunes (fig. 24)
Elevation: 3,960 to 5,210 feet (1,208 to 1,589 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Copia and similar soils: 45 percent
Patriot and similar soils: 40 percent
Minor components: 15 percent
  Mcnew and similar soils
  Pajarito and similar soils
  Tonuco and similar soils
  Wink and similar soils

Description of the Copia Soil

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Shrub-coppice dunes
Parent material: Eolian sands
Slope: 0 to 15 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—80 percent
  woody debris—15 percent
  bare soil—20 percent
  rock fragments—0 percent

*Drainage class*: Excessively drained

*K*<sub>s</sub> (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

*Available water capacity (total inches)*: 4.2 (low)

*Shrink-swell potential*: About 0.2 LEP (low)

*Flooding hazard*: None

*Runoff class*: Very low

*Hydrologic group*: A

*Ecological site name*: Deep Sand

*Ecological site number*: R042XB011NM

*Present vegetation*: Broom snakeweed, fourwing saltbush, and honey mesquite

*Land capability classification (nonirrigated areas)*: 7c

**Typical Pedon**

*Location by Geographic Coordinate System*: lat. 32 degrees 24 minutes 24.10 seconds N. and long. 106 degrees 13 minutes 19.70 seconds W.

C1—0 to 4.5 inches (0 to 12 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common medium and few coarse roots throughout; common fine interstitial pores; noneffervescent; slightly alkaline, pH 7.7; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

C2—4.5 to 27.5 inches (12 to 70 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium and few coarse roots throughout; common fine interstitial pores; noneffervescent; slightly alkaline, pH 7.7; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; diffuse smooth boundary.

C3—27.5 to 60 inches (70 to 152 centimeters); yellowish red (5YR 5/8) fine sand, yellowish red (5YR 5/6) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium and few coarse roots throughout; common fine interstitial pores; noneffervescent; slightly alkaline, pH 7.7; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Clay content of control section (weighted average)*: 0 to 5 percent

*C horizons*:
  Hue—2.5YR, 5YR, or 7.5YR
  Value—4 to 6 dry; 3 to 5 moist
  Chroma—4 to 8, dry or moist
  Texture—fine sand, sand, or loamy fine sand
  Clay content—0 to 5 percent
  Reaction—slightly alkaline or moderately alkaline

**Description of the Patriot Soil**

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

*Geomorphic position*: Intermontes

*Parent material*: Eolian sands over alluvium
Slope: 0 to 5 percent

Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—25 percent
  - woody debris—5 percent
  - bare soil—75 percent
  - rock fragments—0 percent

Drainage class: Well drained

$K_s$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

Available water capacity (total inches): 8.2 (high)

Shrink-swell potential: About 3.2 LEP (moderate)

Flooding hazard: None

Runoff class: Very low

Hydrologic group: B

Ecological site name: Sandy

Ecological site number: R042XB012NM

Present vegetation: Fourwing saltbush and honey mesquite

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 24 minutes 15.00 seconds N. and long. 106 degrees 13 minutes 29.00 seconds W.

A—0 to 4 inches (0 to 10 centimeters); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; 5 percent clay; weak medium platy structure; soft, very friable, nonsticky, nonplastic; common medium roots throughout; few fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.4; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw—4 to 12 inches (10 to 30 centimeters); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; few medium and common fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.4; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Btk—12 to 31.5 inches (30 to 80 centimeters); yellowish red (5YR 4/6) sandy loam, reddish brown (5YR 4/4) moist; 12 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; common fine dendritic tubular pores; few faint clay bridges between sand grains; common fine threadlike carbonate masses throughout; strongly effervescent, 7 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

2Bk—31.5 to 60 inches (80 to 152 centimeters); pink (7.5YR 8/3) sandy clay loam, pink (7.5YR 7/3) moist; 25 percent clay; moderate medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; common fine dendritic tubular pores; many medium irregular carbonate masses throughout;
violently effervescent, 26 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 8 to 18 percent

A horizon:
- Hue—5YR or 7.5YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—sand, fine sand, loamy sand, loamy fine sand, or loamy very fine sand
- Clay content—0 to 8 percent
- Reaction—slightly alkaline or moderately alkaline

Bw horizon:
- Hue—5YR or 7.5YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—sand, fine sand, loamy sand, loamy fine sand, loamy very fine sand, sandy loam, or fine sandy loam
- Clay content—0 to 8 percent
- Reaction—slightly alkaline or moderately alkaline

Btk horizon:
- Hue—2.5YR, 5YR, or 7.5YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy loam, fine sandy loam, or very fine sandy loam
- Clay content—8 to 18 percent
- Calcium carbonate equivalent—5 to 15 percent
- Reaction—slightly alkaline or moderately alkaline

2Bk horizon (if it occurs):
- Hue—5YR or 7.5YR
- Value—4 to 8 dry; 3 to 7 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam, fine sandy loam, or sandy clay loam
- Clay content—18 to 27 percent
- Calcium carbonate equivalent—15 to 40 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features

- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 4 to 12 inches (Bw horizon)
- Argillic horizon—the zone from 12 to 31.5 inches (Btk horizon)
- Calcic horizon—the zone from 12 to 60 inches (Btk and 2Bk horizons)

20—Copia-Wink-Tonuco complex, 0 to 18 percent slopes

Map Unit Setting

Landform(s): Dunes, fan piedmonts, and interdunes
Elevation: 4,470 to 5,580 feet (1,363 to 1,700 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Copia and similar soils: 47 percent
Wink and similar soils: 26 percent
Tonuco and similar soils: 15 percent
Minor components: 12 percent
- Bissett and similar soils
- Mimbres and similar soils
- Pajarito and similar soils
- Petrocalcids with a coarse-loamy particle-size class
- Duneland
- Gullied land
- Riverwash

Description of the Copia Soil

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Sand sheets and dunes on stabilized piedmonts
Parent material: Eolian sands
Slope: 3 to 18 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—10 percent
  - woody debris—0 percent
  - bare soil—90 percent
  - rock fragments—10 percent gravel
Drainage class: Excessively drained
$K_{sat}$ (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)
Available water capacity (total inches): 4.2 (low)
Shrink-swell potential: About 0.4 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: A
Ecological site name: Deep Sand
Ecological site number: R042XB011NM
Present vegetation: Honey mesquite, sand dropseed, and spike dropseed
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 45 minutes 24.50 seconds N. and long. 106 degrees 36 minutes 56.90 seconds W.
C1—0 to 4.5 inches (0 to 12 centimeters); reddish brown (5YR 5/4) fine sand, reddish brown (5YR 5/3) moist; 3 percent clay; single grain; loose, loose, nonsticky,
nonplastic; few fine and medium roots throughout; many fine interstitial pores; noneffervescent; moderately alkaline, pH 7.9; gradual wavy boundary.

C2—4.5 to 52 inches (12 to 132 centimeters); reddish brown (5YR 5/4) fine sand, reddish brown (5YR 5/3) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine and medium roots throughout; many fine interstitial pores; noneffervescent; moderately alkaline, pH 7.9; gradual wavy boundary.

C3—52 to 60 inches (132 to 152 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 5 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; noneffervescent; moderately alkaline, pH 7.9.

Range in Characteristics

Clay content of control section (weighted average): 1 to 5 percent

C horizons:
- Hue—5YR or 7.5YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—coarse sand, sand, fine sand, loamy sand, or loamy fine sand
- Clay content—1 to 5 percent

Description of the Wink Soil

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

Geomorphic position: Intermontes of stabilized sand sheets and drainageways on fan piedmonts

Parent material: Sandy alluvium and/or eolian sands

Slope: 0 to 8 percent

Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—35 percent
  - woody debris—5 percent
  - bare soil—70 percent
  - rock fragments—8 percent gravel

Drainage class: Well drained

$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (3.00 to 42.00 micrometers per second)

Available water capacity (total inches): 7.7 (high)

Shrink-swell potential: About 1.7 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: B

Ecological site name: Sandy

Ecological site number: R042XB012NM

Present vegetation: Fourwing saltbush, honey mesquite, spike dropseed, and wolfberry

Land capability classification (nonirrigated areas): 7c
Typical Pedon

*Location by Geographic Coordinate System:* lat. 33 degrees 48 minutes 18.20 seconds N. and long. 106 degrees 43 minutes 15.50 seconds W.

**AC**—0 to 2.5 inches (0 to 6 centimeters); strong brown (7.5YR 4/6) loamy sand, brown (7.5YR 4/4) moist; 10 percent clay; weak fine subangular blocky structure; loose, loose, nonsticky, nonplastic; few coarse and common fine roots throughout; common fine interstitial pores; finely disseminated carbonate throughout; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; diffuse smooth boundary.

**Bk1**—2.5 to 19.5 inches (6 to 50 centimeters); strong brown (7.5YR 5/6) sandy loam, strong brown (7.5YR 4/6) moist; 17 percent clay; weak medium subangular blocky structure; slightly hard, very friable, moderately sticky, moderately plastic; few fine roots throughout; few fine irregular pores; finely disseminated carbonate throughout; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; diffuse smooth boundary.

**Bk2**—19.5 to 60 inches (50 to 152 centimeters); pink (7.5YR 7/3) sandy loam, light brown (7.5YR 6/3) moist; 13 percent clay; weak medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few distinct carbonate coats on rock fragments; finely disseminated carbonate and common fine and medium spherical carbonate masses throughout; 12 percent gravel; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 15 to 18 percent

*Other characteristics:* Some pedons have a cambic (Bw) horizon

**AC horizon:**
- Hue—5YR or 7.5YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—4 to 6, dry or moist
- Texture—loamy sand, loamy fine sand, sandy loam, or fine sandy loam
- Clay content—5 to 10 percent
- Calcium carbonate equivalent—0 to 10 percent
- Reaction—slightly alkaline or moderately alkaline

**Bk horizons:**
- Hue—5YR or 7.5YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy loam, fine sandy loam, or loam
- Clay content—10 to 18 percent
- Rock fragment content—0 to 15 percent
- Calcium carbonate equivalent—5 to 25 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (AC and Bk1 horizons)
- Cambic horizon—the zone from 3 to 19.5 inches (Bk1 horizon)
- Calcic horizon—the zone from 19.5 to 60 inches (Bk2 horizon)

**Description of the Tonuco Soil**

*Taxonomic classification:* Sandy, mixed, thermic, shallow Typic Petrocalcids

*Geomorphic position:* Stabilized fan piedmonts
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**Parent material:** Eolian sands

**Slope:** 0 to 4 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—30 percent
  - woody debris—15 percent
  - bare soil—80 percent
  - rock fragments—0 percent

**Depth to restrictive feature(s):** 10 to 14 inches to petrocalcic horizon

**Drainage class:** Well drained

- $K_{sat}$ (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
- $K_{sat}$ (restrictive layer): 0.00 inches per hour (0.00 to 0.02 micrometer per second)

**Available water capacity (total inches):** 0.7 (very low)

**Shrink-swell potential:** About 0.5 LEP (low)

**Flooding hazard:** None

**Runoff class:** Very high

**Hydrologic group:** D

**Ecological site name:** Shallow Sandy

**Ecological site number:** R042XB015NM

**Present vegetation:** Broom snakeweed and honey mesquite

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 33 degrees 48 minutes 26.76 seconds N. and long. 106 degrees 43 minutes 40.31 seconds W.

- **A—**0 to 1.5 inches (0 to 4 centimeters); yellowish brown (10YR 5/6) sand, yellowish brown (10YR 5/4) moist; 3 percent clay; weak thin platy structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few fine irregular pores; finely disseminated carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

- **Bw—**1.5 to 12 inches (4 to 31 centimeters); yellowish brown (10YR 5/6) loamy sand, yellowish brown (10YR 5/4) moist; 6 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; finely disseminated carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

- **2Bkkm—**12 inches (31 centimeters); very pale brown (10YR 8/2) cemented material, very pale brown (10YR 8/2) moist; violently effervescent, 20 percent calcium carbonate equivalent; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

- **Clay content of control section (weighted average):** 2 to 10 percent

- **Rock fragment content in control section:** 0 to 5 percent

- **Other characteristics:** Some pedons have a 2Bk horizon below the 2Bkkm horizon.
A horizon:
Hue—7.5YR or 10YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—4 to 6, dry or moist
Texture—coarse sand, sand, fine sand, very fine sand, loamy sand, or loamy fine sand
Clay content—2 to 10 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—4 to 6, dry or moist
Texture—fine sand, loamy sand, or loamy fine sand
Clay content—5 to 10 percent

2Bkkm horizon:
Cemented material—calcium carbonate
Hardness—extremely hard or indurated
Thickness—10 to 40 inches; laterally continuous

Diagnostic Features
• Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
• Cambic horizon—the zone from 1.5 to 12 inches (Bw horizon)
• Depth to petrocalcic horizon—12 inches (2Bkkm horizon)

21—Corvus-Peligro complex, 0 to 10 percent slopes

Map Unit Setting
Landform(s): Dunes (fig. 25)
Elevation: 3,950 to 4,050 feet (1,204 to 1,233 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition
Corvus and similar soils: 75 percent
Peligro and similar soils: 20 percent
Minor components: 5 percent
  Basso and similar soils
  Gypsic Haplosalids with a fine-gypseous particle-size class and similar soils
  Flake and similar soils
  Talos and similar soils

Description of the Corvus Soil
Taxonomic classification: Coarse-gypseous, hypergypseic, thermic, shallow Typic Petrogypsids
Geomorphic position: All positions of stabilized gypsum dunes
Parent material: Gypsiferous eolian sands
Slope: 0 to 10 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
lichen—0 percent  
moss—0 percent  
cryptogamic crust—25 percent  
Chemical crust:  
salt—0 percent  
gypsum—8 percent  
Physical cover:  
canopy plant cover—40 percent  
woody debris—12 percent  
bare soil—40 percent  
rock fragments—0 percent  

Depth to restrictive feature(s): 10 to 14 inches to petrogypsic horizon

Drainage class: Well drained

$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second) 

$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.01 to 0.42 micrometer per second)

Available water capacity (total inches): 1.9 (very low)

Shrink-swell potential: About 1.2 LEP (low)

Flooding hazard: None

Runoff class: Medium

Hydrologic group: D

Ecological site name: Gyp Outcrop

Ecological site number: R042XB007NM

Present vegetation: Hairy coldenia, alkali sacaton, and gyp dropseed

Land capability classification (nonirrigated areas): 7c
Typical Pedon (fig. 26)

Location by Geographic Coordinate System: lat. 32 degrees 44 minutes 20.30 seconds N. and long. 106 degrees 10 minutes 13.90 seconds W.

Ayy—0 to 2 inches (0 to 5 centimeters); pale orange yellow (10YR 9/2) gypsiferous loam, very pale brown (10YR 8.5/2) moist; 12 percent clay; weak thick platy over weak fine and medium subangular blocky structure; soft, friable, nonsticky, nonplastic; common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 86 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Byy1—2 to 8 inches (5 to 20 centimeters); pale orange yellow (10YR 9/2) gypsiferous loam, very pale brown (10YR 8.5/2) moist; 14 percent clay; moderate coarse and very coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; finely
disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 84 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 2.5 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Byy—8 to 12 inches (20 to 30 centimeters); pale orange yellow (10YR 9/2) gypsiferous loam, very pale brown (10YR 8.5/2) moist; 16 percent clay; moderate coarse and very coarse subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 93 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 4.0 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 5.0; abrupt wavy boundary.

Bny—12 to 23 inches (30 to 58 centimeters); white (10YR 9.5/1) cemented material, white (10YR 9/1) moist; many very fine irregular gypsum crystals throughout; slightly effervescent, 4 percent calcium carbonate equivalent and 78 percent gypsum; electrical conductivity of 13.4 dS/m (mmhos/cm); moderately saline; sodium adsorption ratio of 13.0; gradual wavy boundary.

Cnyz—23 to 40 inches (58 to 102 centimeters); white (10YR 9.5/1) gypsiferous loam, white (10YR 9/1) moist; 14 percent clay; moderate extremely coarse prismatic structure; hard, very firm, slightly sticky, slightly plastic; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 5 percent calcium carbonate equivalent and 80 percent gypsum; very strongly alkaline, pH 9.1; electrical conductivity of 13.2 dS/m (mmhos/cm); moderately saline; sodium adsorption ratio of 16.0; gradual wavy boundary.

Cnyyz—40 to 60 inches (102 to 152 centimeters); 30 percent light brown (7.5YR 6/4) and 70 percent white (10YR 9.5/1) gypsiferous loam, 30 percent brown (7.5YR 5/4) and 70 percent white (10YR 9/1) moist; 12 percent clay; moderate extremely coarse prismatic structure; moderately hard, firm, slightly sticky, slightly plastic; finely disseminated carbonate and many very fine and medium irregular gypsum crystals throughout; slightly effervescent, 6 percent calcium carbonate equivalent and 73 percent gypsum; strongly alkaline, pH 9.0; electrical conductivity of 13.2 dS/m (mmhos/cm); moderately saline; sodium adsorption ratio of 20.0.

Range in Characteristics

Clay content of control section (weighted average): 10 to 25 percent

Ayy horizon:
Hue—10YR or 2.5Y
Value—7 to 9.5 dry; 6 to 9 moist
Chroma—1 to 3, dry or moist
Texture—gypsiferous sandy loam, gypsiferous loam, or gypsiferous silt loam
Clay content—12 to 20 percent
Gypsum content—70 to 95 percent
Reaction—slightly alkaline or moderately alkaline

Byy horizons:
Hue—10YR or 2.5Y
Value—7 to 9.5 dry; 6 to 9 moist
Chroma—1 to 3, dry or moist
Texture—gypsiferous sandy loam, gypsiferous loam, or gypsiferous silt loam
Clay content—10 to 20 percent
Gypsum content—80 to 100 percent
Reaction—slightly alkaline or moderately alkaline
Bnyyzm horizon:
  Cemented material—gypsum
  Hardness—extremely hard or indurated
  Thickness—4 to 20 inches; laterally discontinuous

Cnyyz horizons:
  Hue—7.5YR, 10YR, or 2.5Y
  Value—6 to 9.5 dry; 5 to 9 moist
  Chroma—1 to 4, dry or moist
  Texture—gypsiferous sandy loam, gypsiferous loam, or gypsiferous silt loam
  Clay content—10 to 25 percent
  Gypsum content—70 to 90 percent
  Reaction—slightly alkaline to very strongly alkaline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 2 inches (Ayy horizon)
• Gypsic horizon—the zone from 2 to 12 inches (Byy1 and Byy2 horizons)
• Petrogypsic horizon—the zone from 12 to 23 inches (Bnyyzm horizon)

Description of the Peligro Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: All positions of stabilized gypsum dunes
Parent material: Gypsiferous eolian sands
Slope: 0 to 10 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—20 percent

Chemical crust:
  salt—0 percent
  gypsum—10 percent

Physical cover:
  canopy plant cover—35 percent
  woody debris—10 percent
  bare soil—40 percent
  rock fragments—0 percent

Drainage class: Excessively drained
K_{sat} (solum): 0.57 inch to 19.98 inches per hour (4.00 to 141.00 micrometers per
second)
Available water capacity (total inches): 3.8 (low)
Shrink-swell potential: About 1.0 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: B
Ecological site name: Gyp Outcrop
Ecological site number: R042XB007NM
Present vegetation: Fourwing saltbush and hairy coldenia
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 44 minutes 6.40 seconds
N. and long. 106 degrees 10 minutes 23.80 seconds W.
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

Ayy—0 to 4 inches (0 to 10 centimeters); very pale brown (10YR 8.5/3) gypsiferous sandy loam, light gray (10YR 7/2) moist; 8 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 6 percent calcium carbonate equivalent and 83 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Byy—4 to 28 inches (10 to 71 centimeters); white (10YR 9/1) gypsiferous loamy sand, very pale brown (10YR 8/2) moist; 4 percent clay; weak medium subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; few medium roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 5 percent calcium carbonate equivalent and 87 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 3.6 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Cyy—28 to 60 inches (71 to 152 centimeters); white (10YR 9/1) gypsiferous sand, very pale brown (10YR 8/2) moist; 2 percent clay; massive; hard, very firm, nonsticky, nonplastic; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 91 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 2 to 6 percent

Ayy horizon:
- Hue—10YR or 2.5Y
- Value—7 to 9.5 dry; 6 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous loam, or gypsiferous silt loam
- Clay content—8 to 20 percent
- Gypsum content—60 to 95 percent

Byy horizon:
- Hue—10YR or 2.5Y
- Value—7 to 9.5 dry; 6 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand or gypsiferous loamy sand
- Clay content—2 to 6 percent
- Gypsum content—60 to 95 percent

Cyy horizon:
- Hue—10YR or 2.5Y
- Value—7 to 9.5 dry; 6 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand or gypsiferous loamy sand
- Clay content—2 to 6 percent
- Gypsum content—60 to 95 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 4 inches (Ayy horizon)
- Gypsic horizon—the zone from 4 to 28 inches (Byy horizon)
22—Deama-Penagua-Rock outcrop complex, 35 to 90 percent slopes

Map Unit Setting

*Landform(s):* Escarpments and mountains (fig. 27)

*Elevation:* 4,490 to 8,660 feet (1,370 to 2,640 meters)

*Mean annual precipitation:* 14 to 18 inches (356 to 457 millimeters)

*Mean annual air temperature:* 46 to 50 degrees F (8.0 to 10.0 degrees C)

*Mean annual soil temperature:* 48 to 52 degrees F (9.1 to 11.1 degrees C)

*Frost-free period:* 120 to 180 days

*Major Land Resource Area:* 70C—Central New Mexico Highlands

*Land Resource Unit:* 70C.1 Central New Mexico Highlands

Map Unit Composition

Deama and similar soils: 35 percent
Penagua and similar soils: 35 percent
Rock outcrop: 25 percent
Minor components: 5 percent
  Cuate and similar soils
  Ildecarb and similar soils
  Tanbark and similar soils
  Winona and similar soils
  Riverwash

Figure 27.—An area of map unit 22 (Deama-Penagua-Rock outcrop complex, 35 to 90 percent slopes).
Description of the Deama Soil

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

*Geomorphic position:* Summits, shoulders, and backslopes of limestone mountains

*Parent material:* Gravelly colluvium derived from limestone

*Slope:* 35 to 90 percent

*Surface cover*

  - Biological crust: cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

*Chemical crust:*

  - salt—0 percent
  - gypsum—0 percent

*Physical cover:*

  - canopy plant cover—55 percent
  - woody debris—15 percent
  - bare soil—5 percent
  - rock fragments—35 percent gravel, 25 percent cobbles, and 10 percent stones

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

*Drainage class:* Well drained

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

*Drainage class (restrictive layer):* 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

*Available water capacity (total inches):* 1.6 (very low)

*Shrink-swell potential:* About 1.9 LEP (low)

*Flooding hazard:* None

*Runoff class:* Very high

*Hydrologic group:* D

*Ecological site name:* Juniperus monosperma-Pinus edulis/Chrysothamnus nauseosus/Bouteloua gracilis-Bouteloua curtipendula

*Ecological site number:* F070CY125NM

*Present vegetation:* Banana yucca, blue grama, fluffgrass, mountain mahogany, oneseed juniper, and pinyon

*Land capability classification (nonirrigated areas):* 6c

Typical Pedon

*Location by Geographic Coordinate System:* lat. 33 degrees 18 minutes 37.60 seconds N. and long. 106 degrees 34 minutes 15.70 seconds W.

A—0 to 10 inches (0 to 25 centimeters); brown (7.5YR 4/3) very cobbly loam, dark brown (7.5YR 3/3) moist; 23 percent clay; moderate coarse granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate throughout; 20 percent gravel, 20 percent cobbles, and 10 percent stones; violently effervescent, 28 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bkk—10 to 17.5 inches (25 to 45 centimeters); pinkish gray (7.5YR 6/2) very cobbly loam, brown (7.5YR 5/3) moist; 26 percent clay; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine, fine, medium, and coarse roots throughout; many very fine and fine dendritic tubular pores; many medium irregular carbonate masses throughout; 15 percent gravel, 15 percent cobbles, and 10 percent stones; violently effervescent,
56 percent calcium carbonate equivalent; neutral, pH 7.3; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

R—17.5 inches (45 centimeters); unweathered, unfractured, and indurated limestone.

Range in Characteristics

Clay content of control section (weighted average): 22 to 28 percent
Rock fragment content in control section: 35 to 60 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—3 to 5 dry; 2.5 to 3 moist
- Chroma—2 to 3, dry or moist
- Texture—sandy loam, loam, or clay loam
- Clay content—18 to 32 percent
- Rock fragment content—35 to 55 percent
- Reaction—neutral or slightly alkaline

Bkk horizon:
- Hue—7.5YR or 10YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—loam or clay loam
- Clay content—20 to 35 percent
- Rock fragment content—35 to 60 percent
- Calcium carbonate equivalent—40 to 60 percent
- Reaction—neutral or slightly alkaline
- Salinity—nonsaline or very slightly saline

Diagnostic Features
- Mollic epipedon—the zone from 0 to 10 inches (A horizon)
- Calcic horizon—the zone from 10 to 17.5 inches (Bkk horizon)
- Depth to lithic contact—17.5 inches (R horizon)

Description of the Penagua Soil

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Aridic Calciustolls
Geomorphic position: Backslopes, footslopes, and toeslopes of limestone mountains
Parent material: Gravelly colluvium derived from limestone
Slope: 35 to 90 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—65 percent
  - woody debris—10 percent
  - bare soil—18 percent
  - rock fragments—55 percent gravel and 10 percent cobbles

Drainage class: Well drained

$K_{sat}$ (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Available water capacity (total inches): 3.8 (low)
Shrink-swell potential: About 1.3 LEP (low)
Flooding hazard: None
Runoff class: Medium
Hydrologic group: A
Ecological site name: Juniperus monosperma-Pinus edulis/Chrysothamnus nauseosus/Bouteloua gracilis-Bouteloua curtipendula
Ecological site number: F070CY125NM
Present vegetation: Blue grama, banana yucca, mountain mahogany, New Mexico feathergrass, one-seed juniper, and two-needle pinyon
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 10 minutes 32.00 seconds N. and long. 106 degrees 39 minutes 18.10 seconds W.

A—0 to 11.5 inches (0 to 29 centimeters); brown (7.5YR 4/3) extremely gravelly loam, dark brown (7.5YR 3/3) moist; 26 percent clay; moderate medium granular structure; slightly hard, friable, slightly sticky, moderately plastic; few medium and common very fine and fine roots throughout; common very fine interstitial pores; finely disseminated carbonate throughout; 55 percent gravel, 10 percent cobbles, and 1 percent stones; violently effervescent, 22 percent calcium carbonate equivalent; neutral, pH 7.3; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk—11.5 to 27 inches (29 to 69 centimeters); brown (7.5YR 5/4) extremely gravelly clay loam, brown (7.5YR 4/4) moist; 30 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; few fine and medium and common very fine and fine roots throughout; few medium dendritic tubular and common very fine interstitial pores; common coarse and very coarse irregular carbonate masses throughout; 55 percent gravel, 10 percent cobbles, and 1 percent stones; violently effervescent, 38 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bkk—27 to 60 inches (69 to 152 centimeters); pink (7.5YR 7/4) very gravelly sandy loam, light brown (7.5YR 6/4) moist; 17 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few very fine and fine roots throughout; few fine dendritic tubular and common fine interstitial pores; common coarse and many very coarse irregular carbonate masses throughout; 45 percent gravel and 10 percent cobbles; violently effervescent, 63 percent calcium carbonate equivalent; neutral, pH 7.3; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 18 to 26 percent
Rock fragment content in control section: 35 to 80 percent

A horizon:
   Hue—7.5YR or 10YR
   Value—3 to 4 dry; 2.5 to 3 moist
   Chroma—2 to 3, dry or moist
   Texture—sandy loam or loam
   Clay content—16 to 27 percent
   Rock fragment content—35 to 75 percent
   Reaction—neutral or slightly alkaline

Bk horizon:
   Hue—7.5YR or 10YR
   Value—3 to 5 dry; 2.5 to 4 moist
Chroma—2 to 4, dry or moist
Texture—loam or clay loam
Clay content—20 to 30 percent
Rock fragment content—35 to 75 percent
Calcium carbonate equivalent—25 to 40 percent
Reaction—neutral or slightly alkaline

Bkk horizon:
Hue—7.5YR or 10YR
Value—6 to 7 dry; 5 to 6 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, loam, or silty clay loam
Clay content—17 to 35 percent
Rock fragment content—35 to 80 percent
Calcium carbonate equivalent—40 to 65 percent
Reaction—neutral or slightly alkaline
Salinity—nonsaline or very slightly saline

Diagnostic Features
• Mollic epipedon—the zone from 0 to 11.5 inches (A horizon)
• Calcic horizon—the zone from 11.5 to 60 inches (Bk and Bkk horizons)

Description of Rock Outcrop
This component consists of exposures of steep, flat, or rolling bedrock and cliffs. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

23—Deama-Rock outcrop complex, 30 to 90 percent slopes

Map Unit Setting

Landform(s): Mountains (fig. 28)
Elevation: 4,360 to 8,640 feet (1,330 to 2,635 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 46 to 50 degrees F (8.0 to 10.0 degrees C)
Mean annual soil temperature: 48 to 52 degrees F (9.1 to 11.1 degrees C)
Frost-free period: 120 to 180 days
Major Land Resource Area: 70C—Central New Mexico Highlands
Land Resource Unit: 70C.1 Central New Mexico Highlands

Map Unit Composition

Deama and similar soils: 50 percent
Rock outcrop: 35 percent
Minor components: 15 percent
  Aridic Argiustolls and similar soils
  Cuate and similar soils
  Penagua and similar soils
  Petrocalcic Paleustolls and similar soils

Description of the Deama Soil
Taxonomic classification: Loamy-skeletal, carbonatic, mesic Lithic Calciustolls
Geomorphic position: All positions of limestone mountains
Parent material: Gravelly slope alluvium over residuum weathered from limestone
Slope: 30 to 90 percent
Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—80 percent
- woody debris—15 percent
- bare soil—10 percent
- rock fragments—50 percent gravel and 5 percent cobbles

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

Drainage class: Well drained

$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

Available water capacity (total inches): 1.5 (very low)

Shrink-swell potential: About 1.3 LEP (low)

Flooding hazard: None

Runoff class: Very high

Hydrologic group: D

Ecological site name: Limestone Hills

Ecological site number: R070XC107NM
Present vegetation: Banana yucca, blue grama, galleta, Mormon tea, mountain mahogany, oneseed juniper, pinyon, sideoats grama, and winterfat

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 47 minutes 52.10 seconds N. and long. 106 degrees 10 minutes 49.50 seconds W.

A—0 to 2.5 inches (0 to 6 centimeters); brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; 16 percent clay; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine and few fine roots throughout; few fine tubular pores; few prominent carbonate coats on rock fragments; finely disseminated carbonate throughout; 50 percent gravel and 5 percent cobbles; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk—2.5 to 10 inches (6 to 26 centimeters); brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; 22 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine and few fine roots throughout; few fine tubular pores; common prominent carbonate coats on rock fragments; common fine irregular carbonate masses throughout; 45 percent gravel and 5 percent cobbles; violently effervescent, 28 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bkk—10 to 18 inches (26 to 46 centimeters); very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 5/3) moist; 13 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots throughout; few fine tubular pores; many prominent carbonate coats on rock fragments; many fine irregular carbonate masses throughout; 55 percent gravel and 2 percent cobbles; violently effervescent, 50 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; electrical conductivity of 1.8 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

R—18 inches (46 centimeters); unweathered, unfractured, and indurated limestone.

Range in Characteristics

Clay content of control section (weighted average): 12 to 27 percent

Rock fragment content in control section: 35 to 70 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 2 to 3 moist
- Chroma—2 to 3, dry or moist
- Texture—sandy loam or loam
- Clay content—16 to 24 percent
- Rock fragment content—5 to 65 percent
- Reaction—slightly alkaline or moderately alkaline

Bk horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 2 to 4 moist
- Chroma—1 to 3, dry or moist
- Clay content—20 to 25 percent
- Rock fragment content—35 to 70 percent
- Calcium carbonate equivalent—15 to 40 percent
- Reaction—slightly alkaline or moderately alkaline
Bkk horizon:
  Hue—7.5YR or 10YR
  Value—4 to 8 dry; 3 to 6 moist
  Chroma—1 to 3, dry or moist
  Texture—sandy loam, loam, or sandy clay loam
  Clay content—12 to 27 percent
  Rock fragment content—35 to 70 percent
  Calcium carbonate equivalent—40 to 60 percent
  Reaction—slightly alkaline or moderately alkaline
  Salinity—nonsaline or very slightly saline

Diagnostic Features
• Mollic epipedon—the zone from 0 to 10 inches (A and Bk horizons)
• Calcic horizon—the zone from 10 to 18 inches (Bkk horizon)
• Depth to lithic contact—18 inches (R horizon)

Description of Rock Outcrop
This component consists of exposures of steep, flat, or rolling bedrock and cliffs. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

24—Delnorte-Stagecoach-Turney complex, 0 to 15 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts and fan remnants
Elevation: 3,940 to 5,870 feet (1,202 to 1,788 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition
Delnorte and similar soils: 35 percent
Stagecoach and similar soils: 35 percent
Turney and similar soils: 25 percent
Minor components: 5 percent
  Adelino and similar soils
  Agustin and similar soils
  Hermes and similar soils
  Loki and similar soils
  Mimbres and similar soils
  Vado and similar soils
  Wink and similar soils
  Ybar and similar soils
  Riverwash

Description of the Delnorte Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic, shallow Calcic Petrocalcids
Geomorphic position: Crests and shoulders of fan remnants
Parent material: Mixed gravelly alluvium
Slope: 1 to 15 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
Physical cover:
  canopy plant cover—45 percent
  woody debris—5 percent
  bare soil—30 percent
  rock fragments—45 percent gravel and 2 percent cobbles
Depth to restrictive feature(s): 12 to 16 inches to petrocalcic horizon
Drainage class: Well drained
  $K_{sat}$ (solum): 0.57 inch to 1.98 inches per hour (4.00 to 14.00 micrometers per second)
  $K_{sat}$ (restrictive layer): 0.00 inches per hour (0.00 to 0.02 micrometer per second)
Available water capacity (total inches): 1.4 (very low)
Shrink-swell potential: About 1.6 LEP (low)
Flooding hazard: None
Runoff class: Very high
Hydrologic group: D
Ecological site name: Gravelly
Ecological site number: R042XB010NM
Present vegetation: Black grama, burrograss, creosote bush, soaptree yucca, and tobosa
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 21 minutes 33.80 seconds N. and long. 106 degrees 41 minutes 40.40 seconds W.

A—0 to 3 inches (0 to 8 centimeters); brown (10YR 5/3) gravelly loam, brown (10YR 4/3) moist; 18 percent clay; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 15 percent gravel and 1 percent cobbles; violently effervescent; 7 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk—3 to 15 inches (8 to 38 centimeters); brown (10YR 5/3) very cobbly loam, brown (10YR 4/3) moist; 18 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and common very fine irregular carbonate masses throughout; 20 percent gravel and 20 percent cobbles; violently effervescent; 24 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 1.4 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.

Bkmm—15 inches (38 centimeters); white (7.5YR 9.5/1) indurated material, pinkish white (7.5YR 8.5/2) moist; violently effervescent.

Range in Characteristics
Clay content of control section (weighted average): 10 to 18 percent
Rock fragment content in control section: 35 to 60 percent
Other characteristics: Some pedons have a Bk horizon below the Bkm horizon

A horizon:
• Hue—7.5YR or 10YR
• Value—5 to 6 dry; 3 to 4 moist
• Chroma—3 to 4, dry or moist
• Texture—sandy loam, fine sandy loam, gravelly loam, loam, or silt loam
• Clay content—10 to 18 percent
• Rock fragment content—10 to 45 percent
• Reaction—slightly alkaline or moderately alkaline

Bk horizon:
• Hue—7.5YR or 10YR
• Value—4 to 6 dry; 3 to 4 moist
• Chroma—3 to 4, dry or moist
• Texture—sandy loam, fine sandy loam, or loam
• Clay content—8 to 18 percent
• Rock fragment content—35 to 60 percent
• Reaction—slightly alkaline or moderately alkaline
• Calcium carbonate equivalent—17 to 24 percent

Bkm horizon:
• Cemented material—calcium carbonate
• Hardness—extremely hard or indurated
• Thickness—10 to 40 inches

Diagnostic Features
• Ochric epipedon—the zone from 0 to 3 inches (A horizon)
• Calcic horizon—the zone from 3 to 15 inches (Bk horizon)
• Depth to petrocalcic horizon—15 inches (Bkm horizon)

Description of the Stagecoach Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Typic Haplocalcids
Geomorphic position: Toeslopes, footslopes, and backslopes of fan remnants
Parent material: Mixed gravelly alluvium
Slope: 1 to 15 percent
Surface cover
• Biological crust:
  • cyanobacteria—0 percent
  • lichen—0 percent
  • moss—0 percent
  • cryptogamic crust—0 percent
• Chemical crust:
  • salt—0 percent
  • gypsum—0 percent
• Physical cover:
  • canopy plant cover—35 percent
  • woody debris—10 percent
  • bare soil—35 percent
  • rock fragments—40 percent gravel and 3 percent cobbles

Drainage class: Well drained
\( K_{sat} \) (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Available water capacity (total inches): 4.2 (low)
Shrink-swell potential: About 1.4 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: B
Ecological site name: Gravelly
Ecological site number: R042XB010NM
Present vegetation: Black grama, creosote bush, mesa dropseed, and soaptree yucca

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 21 minutes 31.00 seconds N. and long. 106 degrees 41 minutes 36.20 seconds W.

A—0 to 5 inches (0 to 13 centimeters); brown (10YR 5/3) gravelly sandy loam, brown (10YR 4/3) moist; 16 percent clay; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 15 percent gravel and 1 percent cobbles; violently effervescent, 11 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 1.4 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk1—5 to 30 inches (13 to 76 centimeters); very pale brown (10YR 7/4) very gravelly loam, light yellowish brown (10YR 6/4) moist; 16 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and common fine irregular carbonate masses throughout; 25 percent gravel and 15 percent cobbles; violently effervescent, 27 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 1.6 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk2—30 to 60 inches (76 to 152 centimeters); very pale brown (10YR 7/4) extremely gravelly loam, light yellowish brown (10YR 6/4) moist; 18 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and common fine irregular carbonate masses throughout; 50 percent gravel and 15 percent cobbles; violently effervescent, 36 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 14 to 18 percent
Rock fragment content in control section: 35 to 80 percent

A horizon:
  Hue—7.5YR or 10YR
  Value—4 to 6 dry; 3 to 5 moist
  Chroma—3 to 4, dry or moist
  Texture—sandy loam or fine sandy loam
  Clay content—11 to 16 percent
  Rock fragment content—10 to 45 percent
  Reaction—slightly alkaline or moderately alkaline

Bk horizons:
  Hue—7.5YR or 10YR
  Value—5 to 7 dry; 4 to 6 moist
  Chroma—3 to 6, dry or moist
  Texture—sandy loam, fine sandy loam, or loam
  Clay content—9 to 18 percent
  Rock fragment content—35 to 80 percent
Reaction—slightly alkaline or moderately alkaline
Calcium carbonate equivalent—20 to 36 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 5 inches (A horizon)
- Calcic horizon—the zone from 5 to 60 inches (Bk1 and Bk2 horizons)

**Description of the Turney Soil**

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Typic Haplocalcids
*Geomorphic position:* Piedmont slopes adjacent to fan remnants
*Parent material:* Calcareous fine-loamy alluvium
*Slope:* 0 to 3 percent

**Surface cover**
- **Biological crust:**
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- **Chemical crust:**
  - salt—0 percent
  - gypsum—0 percent
- **Physical cover:**
  - canopy plant cover—80 percent
  - woody debris—5 percent
  - bare soil—25 percent
  - rock fragments—0 percent

**Drainage class:** Well drained

**$K_{sat}$ (solum):** 0.57 inch to 1.98 inches per hour (4.00 to 14.00 micrometers per second)

**Available water capacity (total inches):** 10.8 (very high)

**Shrink-swell potential:** About 3.6 LEP (moderate)

**Flooding hazard:** None

**Runoff class:** Low

**Hydrologic group:** B

**Ecological site name:** Loamy

**Ecological site number:** R042XB014NM

**Present vegetation:** Tarbush and tobosa

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 32 degrees 32 minutes 17.90 seconds N. and long. 106 degrees 23 minutes 20.30 seconds W.

A—0 to 3 inches (0 to 8 centimeters); light brownish gray (10YR 6/2) sandy clay loam, brown (10YR 5/3) moist; 25 percent clay; moderate thick platy structure parting to moderate medium platy; slightly hard, firm, nonsticky, nonplastic; few fine roots throughout; few fine and medium dendritic tubular pores; 2 percent gravel; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.

Bk1—3 to 17.5 inches (8 to 45 centimeters); brown (7.5YR 4/3) sandy clay loam, dark brown (7.5YR 3/3) moist; 23 percent clay; moderate fine and medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; few medium and common fine roots throughout; few fine dendritic tubular pores; common medium irregular carbonate masses on faces of peds; 5 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH...
8.1; electrical conductivity of 2.5 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Bk2—17.5 to 29.5 inches (45 to 75 centimeters); light brown (7.5YR 6/3) sandy clay loam, brown (7.5Y 5/4) moist; 28 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout, common fine threadlike carbonate masses throughout, and common medium irregular carbonate masses around rock fragments; 5 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 4.2 dS/m (mmhos/cm); slightly saline; clear wavy boundary.

Bkk1—29.5 to 42 inches (75 to 107 centimeters); pinkish gray (7.5YR 7/2) clay loam, light brown (7.5YR 6/4) moist; 30 percent clay; moderate fine and medium subangular blocky structure; hard, very firm, moderately sticky, moderately plastic; few fine roots throughout; few fine dendritic tubular pores; common very fine platy carbonate laminae at top of horizon, finely disseminated carbonate throughout, and many medium and coarse irregular carbonate masses throughout; 10 percent gravel; violently effervescent, 19 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 3.7 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Bkk2—42 to 60 inches (107 to 152 centimeters); pink (7.5YR 7/3) clay loam, brown (7.5YR 4/4) moist; 28 percent clay; moderate fine and medium subangular blocky structure; hard, very firm, moderately sticky, moderately plastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many medium and coarse irregular carbonate masses throughout; 10 percent gravel; violently effervescent, 27 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 22 to 34 percent
Rock fragment content in control section: 0 to 15 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—5 to 7 dry; 3 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—loam, sandy clay loam, or clay loam
- Clay content—18 to 34 percent
- Rock fragment content—0 to 5 percent

Bk horizons:
- Hue—7.5YR or 10YR
- Value—4 to 7 dry; 3 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy clay loam or clay loam
- Clay content—20 to 36 percent
- Rock fragment content—0 to 10 percent
- Calcium carbonate equivalent—10 to 20 percent

Bkk horizons:
- Hue—7.5YR or 10YR
- Value—6 to 7 dry; 4 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy clay loam or clay loam
- Clay content—25 to 35 percent
Rock fragment content—0 to 15 percent  
Calcium carbonate equivalent—10 to 30 percent

**Diagnostic Features**

- Ochric epipedon—the zone from 0 to 3 inches (A horizon)
- Calcic horizon—the zone from 3 to 60 inches (Bk1, Bk2, Bkk1, and Bkk2 horizons)

**25—Desario-Cuate complex, 5 to 35 percent slopes**

**Map Unit Setting**

*Landform(s):* Mountains (fig. 29)  
*Elevation:* 4,790 to 8,120 feet (1,460 to 2,475 meters)  
*Mean annual precipitation:* 14 to 18 inches (356 to 457 millimeters)  
*Mean annual air temperature:* 46 to 50 degrees F (8.0 to 10.0 degrees C)  
*Mean annual soil temperature:* 48 to 52 degrees F (9.1 to 11.1 degrees C)  
*Frost-free period:* 120 to 180 days  
*Major Land Resource Area:* 70C—Central New Mexico Highlands  
*Land Resource Unit:* 70C.1 Central New Mexico Highlands

**Map Unit Composition**

- Desario and similar soils: 55 percent  
- Cuate and similar soils: 35 percent  
- Minor components: 10 percent  
  - Argiustolls, shallow and similar soils  
  - Penagua and similar soils  
  - Rock outcrop

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Figure 29.—An area of map unit 25 (Desario-Cuate complex, 5 to 35 percent slopes) is in the background.
Description of the Desario Soil

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

Geomorphic position: Summits and shoulders of limestone mountains

Parent material: Colluvium derived from limestone

Slope: 5 to 35 percent

Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—65 percent
- woody debris—20 percent
- bare soil—5 percent
- rock fragments—55 percent gravel, 5 percent cobbles, and 1 percent stones

Depth to restrictive feature(s): 10 to 14 inches to lithic bedrock

Drainage class: Well drained

$K_{sat}$ (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

Available water capacity (total inches): 1.1 (very low)

Shrink-swell potential: About 1.2 LEP (low)

Flooding hazard: None

Runoff class: High

Hydrologic group: D

Ecological site name: Juniperus monosperma-Pinus edulis/Chrysothamnus nauseosus/Bouteloua gracilis-Bouteloua curtipendula

Ecological site number: F070CY125NM

Present vegetation: Mormon tea, ephedra, banana yucca, oneseed juniper, pinyon pine, skunkbush, and sumac

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 48 minutes 47.20 seconds N. and long. 106 degrees 21 minutes 59.30 seconds W.

A—0 to 8.5 inches (0 to 21 centimeters): brown (10YR 4/3) very gravelly loam, dark brown (10YR 3/3) moist; 18 percent clay; weak very fine granular structure; soft, very friable, slightly sticky, nonplastic; few medium and coarse and common very fine and fine roots throughout; common fine dendritic tubular pores; few distinct carbonate coats on rock fragments; finely disseminated carbonate throughout; 35 percent gravel, 5 percent cobbles, and 1 percent stones; violently effervescent, 23 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk—8.5 to 12 inches (21 to 31 centimeters): brown (10YR 5/3) very gravelly loam, brown (10YR 4/3) moist; 18 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few medium and coarse and common very fine roots throughout; common fine dendritic tubular pores; many prominent carbonate coats on rock fragments; finely disseminated carbonate and common fine irregular carbonate masses throughout; 35 percent gravel, 5 percent cobbles, and 1 percent stones; violently effervescent, 45 percent calcium carbonate.
equivalent; moderately alkaline, pH 8.4; electrical conductivity of 1.8 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.
R—12 inches (31 centimeters); unweathered, unfractured, and indurated limestone.

Range in Characteristics

Clay content of control section (weighted average): 18 to 35 percent

Rock fragment content in control section: 35 to 70 percent

A horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—2 to 4 dry; 1 to 3 moist
- Chroma—1 to 4, dry or moist
- Texture—loam or clay loam
- Clay content—18 to 35 percent
- Rock fragment content—20 to 60 percent

Bk horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—loam or clay loam
- Clay content—18 to 35 percent
- Rock fragment content—35 to 75 percent
- Calcium carbonate equivalent—40 to 70 percent

Diagnostic Features
- Mollic epipedon—the zone from 0 to 8.5 inches (A horizon)
- Calcic horizon—the zone from 8.5 to 12 inches (Bk horizon)
- Depth to lithic contact—12 inches (R horizon)

Description of the Cuate Soil

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

Geomorphic position: Backslopes and footslopes of limestone mountains

Parent material: Colluvium derived from limestone

Slope: 5 to 35 percent

Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—85 percent
  - woody debris—15 percent
  - bare soil—5 percent
  - rock fragments—60 percent gravel and 10 percent cobbles

Depth to restrictive feature(s): 30 to 31 inches to lithic bedrock

Drainage class: Well drained

\( K_{sat} \) (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

\( K_{sat} \) (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

Available water capacity (total inches): 4.0 (low)

Shrink-swell potential: About 3.9 LEP (moderate)

Flooding hazard: None
Runoff class: Medium
Hydrologic group: C
Ecological site name: Juniperus monosperma-Pinus edulis/Chrysothamnus
nauseosus/Bouteloua gracilis-Bouteloua curtipendula
Ecological site number: F070CY125NM
Present vegetation: Banana yucca, oneseed juniper, pinyon pine, and pricklypear
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 44 minutes 16.70
seconds N. and long. 106 degrees 21 minutes 18.20 seconds W.

A—0 to 6 inches (0 to 15 centimeters); dark brown (7.5YR 3/2) clay loam, very dark
brown (7.5YR 2/2) moist; 32 percent clay; moderate medium subangular blocky
structure; slightly hard, friable, moderately sticky, moderately plastic; few fine
and medium and common very fine roots throughout; common very fine and few
fine dendritic tubular pores; few faint carbonate coats on rock fragments; finely
disseminated carbonate throughout; 10 percent gravel; strongly effervescent,
12 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical
conductivity of 0.9 ds/m (mmhos/cm); nonsaline; gradual smooth boundary.

Bkk1—6 to 13.5 inches (15 to 34 centimeters); brown (7.5YR 4/3) gravelly clay loam,
dark brown (7.5YR 3/3) moist; 32 percent clay; strong medium subangular blocky
structure; slightly hard, firm, moderately sticky, moderately plastic; few medium
and common fine roots throughout; common very fine and few fine dendritic
tubular pores; few distinct carbonate coats on rock fragments; finely disseminated
carbonate throughout; 25 percent gravel and 5 percent cobbles; violently
effervescent, 26 percent calcium carbonate equivalent; moderately alkaline, pH
8.1; electrical conductivity of 1.6 ds/m (mmhos/cm); nonsaline; clear smooth
boundary.

Bkk2—13.5 to 30.5 inches (34 to 78 centimeters); reddish brown (5YR 5/4) very
gravelly clay loam, reddish brown (5YR 4/4) moist; 30 percent clay; strong coarse
subangular blocky structure; slightly hard, friable, moderately sticky, moderately
plastic; few fine and medium roots throughout; few fine dendritic tubular pores;
many prominent carbonate coats on rock fragments; finely disseminated carbonate
and common fine irregular carbonate masses throughout; 30 percent gravel
and 10 percent cobbles; violently effervescent, 42 percent calcium carbonate
equivalent; moderately alkaline, pH 8.0; electrical conductivity of 1.7 ds/m
(mmhos/cm); nonsaline; abrupt smooth boundary.

R—30.5 inches (78 centimeters); unweathered, unfractured, and indurated limestone.

Range in Characteristics

Clay content of control section (weighted average): 18 to 35 percent
Rock fragment content in control section: 25 to 75 percent

A horizon:
Hue—5YR, 7.5YR, or 10YR
Value—2 to 4 dry; 1 to 3 moist
Chroma—2 to 4, dry or moist
Texture—loam or clay loam
Clay content—18 to 35 percent
Rock fragment content—10 to 60 percent

Bkk horizons:
Hue—5YR or 7.5YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—2 to 4, dry or moist
Texture—loam or clay loam
Clay content—18 to 35 percent
Rock fragment content—25 to 75 percent; average of more than 35 percent
Calcium carbonate equivalent—35 to 70 percent; average of more than 40 percent
Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
• Mollic epipedon—the zone from 0 to 13.5 inches (A and Bkk1 horizons)
• Calcic horizon—the zone from 13.5 to 30.5 inches (Bkk2 horizon)
• Depth to lithic contact—30.5 inches (R horizon)

26—Dona Ana-Chutum complex, 1 to 10 percent slopes

Map Unit Setting

Landform(s): Drainageways and fan piedmonts (fig. 30)
Elevation: 4,160 to 5,830 feet (1,269 to 1,777 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Dona Ana and similar soils: 65 percent

Figure 30.—An area of map unit 26 (Dona Ana-Chutum complex, 1 to 10 percent slopes).
Chutum and similar soils: 30 percent
Minor components: 5 percent
  Mallet and similar soils
  Riverwash
  Typic Haplargids and similar soils

Description of the Dona Ana Soil

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Typic Calciargids
Geomorphic position: Fan piedmonts
Parent material: Alluvium
Slope: 1 to 10 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
Physical cover:
  canopy plant cover—40 percent
  woody debris—15 percent
  bare soil—30 percent
  rock fragments—5 percent gravel

Drainage class: Well drained
K_{sat} (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Available water capacity (total inches): 8.5 (high)
Shrink-swell potential: About 3.5 LEP (moderate)
Flooding hazard: None

Runoff class: Low
Hydrologic group: B
Ecological site name: Loamy
Ecological site number: R042XB014NM
Present vegetation: Alkali sacaton, black grama, cholla, Torrey ephedra, honey
  mesquite, soaptree yucca, and Torrey’s jointfir
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 32 minutes 46.70 seconds N. and long. 106 degrees 31 minutes 36.90 seconds W.

A—0 to 2 inches (0 to 5 centimeters); weak red (7.5R 5/4) sandy loam, dusky red
(7.5R 3/4) moist; 14 percent clay; moderate thick platy over moderate fine granular
structure; soft, very friable, nonsticky, nonplastic; few very fine roots throughout;
few fine tubular pores; finely disseminated carbonate throughout; 5 percent fine
gravel; slightly effervescent, 2 percent calcium carbonate equivalent; moderately
alkaline, pH 8.2; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; abrupt
smooth boundary.

Bw—2 to 12 inches (5 to 30 centimeters); weak red (7.5R 5/4) sandy loam, dusky red
(7.5R 3/4) moist; 16 percent clay; weak medium subangular blocky structure; soft,
very friable, nonsticky, nonplastic; few very fine and fine roots throughout; few fine
tubular pores; finely disseminated carbonate throughout; 8 percent fine gravel;
slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline,
pH 7.8; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; gradual wavy
boundary.
Btk1—12 to 19.5 inches (30 to 49 centimeters); yellowish red (5YR 5/6) sandy clay loam, reddish brown (5YR 4/4) moist; 26 percent clay; moderate medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; few fine roots throughout; few fine tubular pores; few distinct clay films on all faces of peds; common fine irregular carbonate masses throughout; 5 percent fine gravel; strongly effervescent, 9 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Btk2—19.5 to 55 inches (49 to 140 centimeters); light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; 30 percent clay; moderate medium subangular blocky structure; hard, very firm, moderately sticky, moderately plastic; few very fine roots throughout; few fine tubular pores; few faint clay films on all faces of peds; many medium irregular carbonate masses throughout; 13 percent fine gravel; violently effervescent, 18 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Bk—55 to 60 inches (140 to 152 centimeters); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; 28 percent clay; moderate medium subangular blocky structure; hard, very firm, moderately sticky, moderately plastic; few very fine roots throughout; few fine tubular pores; very few faint clay films on all faces of peds; common medium irregular carbonate masses throughout; 13 percent fine gravel; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 26 to 32 percent
Other characteristics: Some pedons do not have a cambic (Bw) horizon

A horizon:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam or sandy clay loam
- Clay content—8 to 20 percent
- Rock fragment content—0 to 10 percent
- Reaction—slightly alkaline or moderately alkaline
- Calcium carbonate equivalent—0 to 5 percent

Bw horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 6 dry; 3 to 4 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy loam, fine sandy loam, or sandy clay loam
- Clay content—8 to 20 percent
- Rock fragment content—0 to 15 percent
- Reaction—slightly alkaline or moderately alkaline
- Calcium carbonate equivalent—0 to 5 percent

Btk horizons:
- Hue—5YR or 7.5YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy clay loam or clay loam
- Clay content—20 to 35 percent
Rock fragment content—0 to 15 percent  
Reaction—slightly alkaline or moderately alkaline  
Calcium carbonate equivalent—5 to 30 percent

Bk horizon:  
Hue—5YR, 7.5YR, or 10YR  
Value—4 to 7 dry; 4 to 6 moist  
Chroma—3 to 4, dry or moist  
Texture—sandy loam, fine sandy loam, sandy clay loam, or clay loam  
Clay content—18 to 35 percent  
Rock fragment content—0 to 15 percent  
Reaction—slightly alkaline or moderately alkaline  
Calcium carbonate equivalent—5 to 15 percent

Diagnostic Features  
• Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)  
• Cambic horizon—the zone from 2 to 12 inches (Bw horizon)  
• Argillic horizon—the zone from 12 to 55 inches (Btk1 and Btk2 horizons)  
• Calcic horizon—the zone from 19.5 to 70 inches (Btk2 and Bk horizons)

Description of the Chutum Soil

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Typic Haplocalcids  
Geomorphic position: Drainageways and toeslopes of fan piedmonts  
Parent material: Alluvium  
Slope: 1 to 10 percent  
Surface cover  
  Biological crust:  
    cyanobacteria—0 percent  
    lichen—0 percent  
    moss—0 percent  
  Chemical crust:  
    salt—0 percent  
    gypsum—0 percent  
  Physical cover:  
    canopy plant cover—35 percent  
    woody debris—15 percent  
    bare soil—60 percent  
    rock fragments—0 percent  
Drainage class: Well drained  
K<sub>s</sub> (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)  
Available water capacity (total inches): 11.3 (very high)  
Shrink-swell potential: About 4.5 LEP (moderate)  
Flooding hazard: Very rare  
Runoff class: Low  
Hydrologic group: C  
Ecological site name: Loamy  
Ecological site number: R042XB014NM  
Present vegetation: Alkali sacaton, American tarbush, annual grasses, broom  
  snakeweed, burrograss, creosote bush, forbs, annuals, fourwing saltbush, honey  
  mesquite, soaptree yucca, and threawn  
Land capability classification (nonirrigated areas): 7c

Typical Pedon  
Location by Geographic Coordinate System: lat. 32 degrees 35 minutes 46.20 seconds N. and long. 106 degrees 35 minutes 56.70 seconds W.
A—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/4) silt loam, brown (7.5YR 4/3) moist; 25 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium roots throughout; common medium tubular pores; finely disseminated carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; clear smooth boundary.  
Bw—4 to 15.5 inches (10 to 40 centimeters); brown (7.5YR 5/2) clay loam, brown (7.5YR 4/4) moist; 28 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium roots throughout; common medium tubular pores; finely disseminated carbonate throughout; violently effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; diffuse smooth boundary.  
Bk1—15.5 to 31.5 inches (40 to 80 centimeters); pink (7.5YR 7/3) clay loam, light brown (7.5YR 6/3) moist; 32 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots throughout; common fine tubular pores; finely disseminated carbonate and common fine threadlike and common fine irregular carbonate masses throughout; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; diffuse smooth boundary.  
Bk2—31.5 to 60 inches (80 to 152 centimeters); light brown (7.5YR 6/3) clay loam, brown (7.5YR 5/4) moist; 30 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots throughout; common fine tubular pores; finely disseminated carbonate and common fine irregular carbonate masses throughout; violently effervescent, 24 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline.  

**Range in Characteristics**  
*Clay content of control section (weighted average):* 24 to 32 percent  
*Other characteristics:* Some pedons do not have a cambic (Bw) horizon  

A horizon:  
- Hue—7.5YR or 10YR  
- Value—5 to 6 dry; 3 to 4 moist  
- Chroma—3 to 4, dry or moist  
- Texture—coarse sandy loam, sandy loam, fine sandy loam, loam, loam, silt loam, or sandy clay loam  
- Clay content—9 to 25 percent  
- Calcium carbonate equivalent—0 to 2 percent  

Bw horizon:  
- Hue—7.5YR or 10YR  
- Value—4 to 5 dry; 3 to 4 moist  
- Chroma—2 to 6, dry or moist  
- Texture—sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam  
- Clay content—10 to 30 percent  
- Calcium carbonate equivalent—2 to 5 percent  

Bk horizons:  
- Hue—5YR, 7.5YR, or 10YR  
- Value—5 to 8 dry; 4 to 6 moist  
- Chroma—2 to 6, dry or moist  
- Texture—sandy clay loam or clay loam
Clay content—22 to 32 percent
Calcium carbonate equivalent—15 to 25 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
• Cambic horizon—the zone from 4 to 15.5 inches (Bw horizon)
• Calcic horizon—the zone from 15.5 to 60 inches (Bk1 and Bk2 horizons)

27—Elcor-Bissett-Rock outcrop association, 5 to 65 percent slopes

Map Unit Setting
Landform(s): Hills and ridges (fig. 31)
Elevation: 4,990 to 6,000 feet (1,520 to 1,830 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 61 to 64 degrees F (16.0 to 18.0 degrees C)
Mean annual soil temperature: 63 to 66 degrees F (17.1 to 19.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-3 Chihuahuan Desert Grassland

Map Unit Composition
Elcor and similar soils: 50 percent
Bissett and similar soils: 30 percent
Rock outcrop: 15 percent
Minor components: 5 percent
   Chilicotal and similar soils
   Chipotle and similar soils
   Lithic Calcigypsids and similar soils
   Ustic Haplogypsids and similar soils

**Description of the Elcor Soil**

*Taxonomic classification:* Fine-gypseous, hypergypsic, thermic Lithic Haplogypsids

*Geomorphic position:* Scarp slopes on fault block hills

*Parent material:* Residuum weathered from rock gypsum

*Slope:* 10 to 65 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—5 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—5 percent

- Physical cover:
  - canopy plant cover—15 percent
  - woody debris—3 percent
  - bare soil—80 percent
  - rock fragments—0 percent

*Depth to restrictive feature(s):* 6 to 12 inches to lithic bedrock

**Drainage class:** Well drained

- $K_{sat}$ (solum): 0.57 inch to 1.98 inches per hour (4.00 to 14.00 micrometers per second)
- $K_{sat}$ (restrictive layer): 0.06 inch to 0.20 inch per hour (0.42 to 1.40 micrometers per second)

**Available water capacity (total inches):** 1.1 (very low)

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

**Flooding hazard:** None

**Runoff class:** High

**Hydrologic group:** D

*Ecological site name:* Gyp Hills

*Ecological site number:* R042XC013NM

*Present vegetation:* Creosote bush and hairy coldenia

**Land capability classification (nonirrigated areas):** 6c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 33 degrees 37 minutes 43.90 seconds N. and long. 106 degrees 12 minutes 11.00 seconds W.

Ayy—0 to 2.5 inches (0 to 6 centimeters); very pale brown (10YR 7/3) gypsiferous loam, light yellowish brown (10YR 6/4) moist; 24 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; few fine and medium irregular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 65 percent gypsum; slightly alkaline, pH 7.5; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Byy—2.5 to 7 inches (6 to 18 centimeters); very pale brown (10YR 8/3) gypsiferous loam, very pale brown (10YR 7/3) moist; 22 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine
roots throughout; few fine irregular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 87 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 3.8 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

R—7 inches (18 centimeters); unweathered, unfractured, and very strongly cemented gypsum.

Range in Characteristics

Clay content of control section (weighted average): 18 to 27 percent

Ayy horizon:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—3 to 4, dry or moist
Texture—gypsiferous loam or gypsiferous silt loam
Clay content—22 to 27 percent
Gypsum content—60 to 80 percent
Reaction—slightly alkaline or moderately alkaline

Byy horizon:
Hue—7.5YR or 10YR
Value—6 to 8 dry; 5 to 7 moist
Chroma—2 to 4, dry or moist
Texture—gypsiferous loam or gypsiferous silt loam
Clay content—18 to 27 percent
Gypsum content—60 to 90 percent
Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 2.5 inches (Ayy and Byy horizons)
• Gypsic horizon—the zone from 2.5 to 7 inches (Byy horizon)
• Depth to lithic contact—7 inches (R horizon)

Description of the Bissett Soil

Taxonomic classification: Loamy-skeletal, carbonatic, thermic Lithic Ustic Haplocalcids
Geomorphic position: Dip slopes on fault block hills
Parent material: Gravelly colluvium derived from limestone
Slope: 5 to 35 percent
Surface cover
Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
  cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—45 percent
  woody debris—10 percent
  bare soil—10 percent
  rock fragments—70 percent gravel, 10 percent cobbles, and 5 percent stones
Depth to restrictive feature(s): 14 to 20 inches to lithic bedrock
Drainage class: Well drained
K_{sat} (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

\[ K_{\text{sat}} \text{ (restrictive layer): } 0.06 \text{ to } 0.20 \text{ inch per hour (0.42 micrometer to 1.40 micrometers per second) }\]

Available water capacity (total inches): 1.5 (very low)

Shrink-swell potential: About 1.7 LEP (low)

Flooding hazard: None

Runoff class: High

Hydrologic group: D

Ecological site name: Limestone Hills

Ecological site number: R042XC020NM

Present vegetation: Creosote bush, juniper, mariola, ocotillo, pricklypear, and threeawn

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 37 minutes 46.60 seconds N. and long. 106 degrees 12 minutes 20.50 seconds W.

A—0 to 1 inch (0 to 3 centimeters); light brown (7.5YR 6/4) very gravelly sandy loam, brown (7.5YR 4/3) moist; 18 percent clay; weak fine granular and weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; finely disseminated carbonate throughout; 40 percent gravel and 10 percent cobbles; strongly effervescent, 13 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

Bk1—1 to 15.5 inches (3 to 40 centimeters); light brown (7.5YR 6/3) very gravelly sandy clay loam, brown (7.5YR 5/4) moist; 22 percent clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine and few fine roots throughout; few fine irregular pores; common fine irregular carbonate masses and common fine irregular carbonate nodules throughout; 40 percent gravel and 15 percent cobbles; violently effervescent, 42 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

Bk2—15.5 to 19 inches (40 to 48 centimeters); light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 5/4) moist; 25 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; few fine irregular pores; common fine irregular carbonate masses and common fine irregular carbonate nodules throughout; 30 percent gravel and 15 percent cobbles; violently effervescent, 44 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

R—19 inches (48 centimeters); unweathered, unfractured, and indurated limestone.

Range in Characteristics

Clay content of control section (weighted average): 18 to 27 percent

Rock fragment content in control section: 35 to 60 percent

Other characteristics: Some pedons have a weak Bk horizon that does not meet the requirements of carbonatic mineralogy

A horizon:

Hue—7.5YR or 10YR

Value—5 to 6 dry; 4 to 5 moist

Chroma—3 to 4, dry or moist

Texture—sandy loam or loam

Clay content—15 to 20 percent

Rock fragment content—40 to 60 percent

Calcium carbonate equivalent—5 to 15 percent
Reaction—slightly alkaline or moderately alkaline  
Salinity—nonsaline to slightly saline  

**Bk horizons:**  
Hue—7.5YR or 10YR  
Value—6 to 7 dry; 5 to 6 moist  
Chroma—3 to 4, dry or moist  
Texture—sandy clay loam or loam  
Clay content—18 to 27 percent  
Rock fragment content—35 to 60 percent  
Calcium carbonate equivalent—40 to 60 percent  
Reaction—slightly alkaline or moderately alkaline  
Salinity—nonsaline to slightly saline  

**Diagnostic Features**  
• Ochric epipedon—the zone from 0 to 1 inch (A horizon)  
• Calcic horizon—the zone from 1 to 19 inches (Bk1 and Bk2 horizons)  
• Depth to lithic contact—19 inches (R horizon)  

**Description of Rock Outcrop**  
This component consists of exposures of steep, flat, or rolling bedrock and cliffs. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.  

### 28—Flake-Saltspring complex, 0 to 3 percent slopes  

**Map Unit Setting**  
*Landform(s):* Alluvial flats (fig. 32)  
*Elevation:* 3,900 to 4,040 feet (1,190 to 1,230 meters)  
*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)  
*Mean annual air temperature:* 64 to 70 degrees F (18.0 to 21.0 degrees C)  
*Mean annual soil temperature:* 66 to 72 degrees F (19.1 to 22.1 degrees C)  
*Frost-free period:* 180 to 240 days  
*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains  
*Land Resource Unit:* 42-2 Chihuahuan Desert Shrub  

**Map Unit Composition**  
Flake and similar soils: 70 percent  
Saltspring and similar soils: 15 percent  
Minor components: 15 percent  
  - Basso and similar soils  
  - Nasa and similar soils  
  - Peligro and similar soils  
  - Talos and similar soils  

**Description of the Flake Soil**  
*Taxonomic classification:* Fine-loamy, gypsic, thermic Typic Calcigypsids  
*Geomorphic position:* Alluvial flats in areas covered by vegetation  
*Parent material:* Fine-loamy alluvium  
*Slope:* 1 to 3 percent  
*Surface cover*  
  - Biological crust:  
    - cyanobacteria—0 percent  
    - lichen—0 percent
moss—0 percent
cryptogamic crust—6 percent
Chemical crust:
salt—5 percent
gypsum—0 percent
Physical cover:
  canopy plant cover—42 percent
  woody debris—24 percent
  bare soil—43 percent
  rock fragments—0 percent
Drainage class: Well drained
$K_{sat}$ (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)
Available water capacity (total inches): 13.0 (very high)
Shrink-swell potential: About 3.1 LEP (moderate)
Flooding hazard: None
Runoff class: Very low
Hydrologic group: C
Ecological site name: Salt Flats
Ecological site number: R042XB036NM
Present vegetation: Fourwing saltbush, alkali sacaton, desert seepweed, and burrograss
Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 33)

Location by Geographic Coordinate System: lat. 32 degrees 44 minutes 11.60 seconds N. and long. 106 degrees 11 minutes 10.60 seconds W.

A—0 to 4 inches (0 to 10 centimeters); light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/3) moist; 15 percent clay; weak thick platy over moderate fine subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; many
Figure 33.—Representative profile of the Flake soil in map unit 28 (Flake-Saltspring complex, 0 to 3 percent slopes). Scale is in centimeters.

very fine and common fine roots throughout; common fine tubular pores; finely disseminated carbonate throughout; violently effervescent, 25 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 3.0 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; abrupt wavy boundary.

Bk—4 to 10 inches (10 to 25 centimeters); brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; 26 percent clay; moderate medium and coarse subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; many very fine and common fine roots throughout; common very fine and few fine tubular pores; common fine spherical carbonate masses in matrix; violently effervescent, 30 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 3.0 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; clear wavy boundary.
Bky1—10 to 19 inches (25 to 48 centimeters); pink (7.5YR 7/4) gypsiferous silt loam, strong brown (7.5YR 5/6) moist; 26 percent clay; moderate medium and coarse subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; many very fine and common fine roots throughout; few very fine and common fine tubular pores; common fine threadlike carbonate masses and common fine and medium irregular gypsum crystal clusters in matrix; violently effervescent, 19 percent calcium carbonate equivalent and 33 percent gypsum; slightly alkaline, pH 7.5; electrical conductivity of 2.8 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; clear wavy boundary.

Bky2—19 to 28 inches (48 to 71 centimeters); brown (7.5YR 5/4) gypsiferous silt loam, strong brown (7.5YR 4/6) moist; 26 percent clay; moderate fine and medium subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; many very fine roots throughout; few very fine and common fine tubular pores; common fine threadlike carbonate masses and common very fine irregular gypsum crystal clusters in matrix; violently effervescent, 17 percent calcium carbonate equivalent and 41 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 5.6 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 2.0; clear wavy boundary.

Bknyz1—28 to 40 inches (71 to 102 centimeters); strong brown (7.5YR 5/6) gypsiferous clay loam, strong brown (7.5YR 4/6) moist; 32 percent clay; moderate fine and medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; common fine roots throughout; few very coarse and common fine tubular pores; common fine irregular carbonate masses and many very fine irregular gypsum crystal clusters in matrix; violently effervescent, 31 percent calcium carbonate equivalent and 17 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 21.3 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 16.0; clear wavy boundary.

Bknyz2—40 to 63 inches (102 to 160 centimeters); strong brown (7.5YR 5/6) gypsiferous clay loam, strong brown (7.5YR 4/6) moist; 34 percent clay; moderate fine, medium, and coarse subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; few fine tubular pores; common fine irregular carbonate masses and many very fine irregular gypsum crystal clusters in matrix; violently effervescent, 27 percent calcium carbonate equivalent and 21 percent gypsum; moderately alkaline, pH 8.4; electrical conductivity of 24.6 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 33.0; clear wavy boundary.

Bnyz—63 to 70 inches (160 to 178 centimeters); yellowish red (5YR 5/6) gypsiferous clay loam, yellowish red (5YR 4/6) moist; 36 percent clay; weak medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine tubular pores; finely disseminated carbonate throughout and common fine irregular gypsum crystal clusters and common medium spherical gypsum crystal clusters in matrix; violently effervescent, 31 percent calcium carbonate equivalent and 25 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 23.6 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 35.0.

Range in Characteristics

Clay content of control section (weighted average): 18 to 35 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—fine sandy loam, loam, silt loam, or clay loam
Clay content—15 to 35 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline to slightly saline

**Bk horizon:**
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy clay loam, loam, silt loam, or silty clay loam
- Clay content—18 to 35 percent
- Reaction—neutral to moderately alkaline
- Salinity—nonsaline to slightly saline
- Calcium carbonate equivalent—15 to 35 percent

**Bky horizons:**
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—gypsiferous clay loam, gypsiferous silt loam, or gypsiferous silty clay loam
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or moderately saline
- Calcium carbonate equivalent—10 to 30 percent
- Gypsum content—20 to 45 percent

**Bknyz and Bnyz horizons:**
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—gypsiferous sandy clay loam, gypsiferous clay loam, or gypsiferous silt loam
- Clay content—18 to 40 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—moderately saline or strongly saline
- Calcium carbonate equivalent—20 to 40 percent
- Gypsum content—10 to 35 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (A and Bk horizons)
- Cambic horizon—the zone from 4 to 10 inches (Bk horizon)
- Gypsic horizon—the zone from 10 to 70 inches (Bky1, Bky2, Bknyz1, Bknyz2, and Bnyz horizons)
- Calcic horizon—the zone from 28 to 63 inches (Bknyz1 and Bknyz2 horizons)

**Description of the Saltspring Soil**

*Taxonomic classification:* Fine-loamy, gypsic, thermic Gypsic Haplosalids
*Geomorphic position:* Bare areas of alluvial flats
*Parent material:* Fine-loamy alluvium
*Slope:* 0 to 3 percent
*Surface cover*
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—2 percent
Chemical crust:
   salt—15 percent
   gypsum—0 percent

Physical cover:
   canopy plant cover—2 percent
   woody debris—5 percent
   bare soil—95 percent
   rock fragments—0 percent

*Depth to restrictive feature(s):* 0 to 4 inches to salic horizon

*Drainage class:* Well drained

*K_{sat} (solum):* 0.06 inch to 1.98 inches per hour (0.42 micrometer to 14.00 micrometers per second)

*Available water capacity (total inches):* 0.0 (very low)

*Shrink-swell potential:* About 3.7 LEP (moderate)

*Flooding hazard:* None

*Runoff class:* Low

*Hydrologic group:* C

*Ecological site name:* Salt Flats

*Ecological site number:* R042XB036NM

*Present vegetation:* Desert seepweed, iodinebush, and fourwing saltbush

*Land capability classification (nonirrigated areas):* 7c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 32 degrees 44 minutes 11.70 seconds N. and long. 106 degrees 11 minutes 11.65 seconds W.

**Anz**—0 to 2 inches (0 to 5 centimeters); light brown (7.5YR 6/3) silt loam, brown (7.5YR 4/4) moist; 25 percent clay; moderate medium platy structure; slightly hard, friable, moderately sticky, moderately plastic; common fine and medium roots throughout; common fine and medium tubular pores; finely disseminated carbonate throughout; violently effervescent, 14 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 35.0 dS/m (mmhos/cm); strongly saline; abrupt smooth boundary.

**Bknz**—2 to 6.5 inches (5 to 17 centimeters); light brown (7.5YR 6/4) silt loam, brown (7.5YR 5/4) moist; 25 percent clay; strong coarse subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few very fine and common fine roots throughout; few medium and common fine tubular pores; common fine threadlike carbonate masses throughout; violently effervescent, 16 percent calcium carbonate equivalent; neutral, pH 7.2; electrical conductivity of 32.0 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

**Bknyz**—6.5 to 17.5 inches (17 to 45 centimeters); pink (7.5YR 7/4) gypsiferous loam, strong brown (7.5YR 5/8) moist; 22 percent clay; weak medium subangular blocky structure; hard, very firm, slightly sticky, slightly plastic; few coarse and common fine roots throughout; few medium and common fine tubular pores; common fine irregular gypsum masses and common fine threadlike carbonate masses throughout; violently effervescent, 18 percent calcium carbonate equivalent and 21 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 30.0 dS/m (mmhos/cm); strongly saline; abrupt smooth boundary.

**Bkyz1**—17.5 to 34.5 inches (45 to 87 centimeters); reddish yellow (7.5YR 6/8) gypsiferous loam, reddish yellow (7.5YR 6/6) moist; 26 percent clay; strong coarse subangular blocky structure; very hard, extremely firm, moderately sticky, slightly plastic; few very fine roots throughout; few very coarse and common very fine tubular pores; common fine irregular gypsum masses and common fine threadlike carbonate masses throughout; violently effervescent, 11 percent...
calcium carbonate equivalent and 28 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 19.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Bkyz2—34.5 to 52 inches (87 to 132 centimeters); pink (7.5YR 7/3) gypserous clay, reddish yellow (7.5YR 6/6) moist; 41 percent clay; weak fine angular blocky structure; very hard, extremely firm, slightly sticky, slightly plastic; common very fine tubular pores; common fine irregular gypsum masses and common medium irregular carbonate masses throughout; violently effervescent, 13 percent calcium carbonate equivalent and 19 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 23.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Bkyz3—52 to 60 inches (132 to 152 centimeters); reddish yellow (7.5YR 6/6) clay loam, light brown (7.5YR 6/4) moist; 38 percent clay; weak fine angular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine tubular pores; common fine irregular gypsum masses and common fine threadlike carbonate masses throughout; violently effervescent, 16 percent calcium carbonate equivalent and 6 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 17.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 18 to 45 percent; average of less than 35 percent

Anz horizon:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—fine sandy loam, loam, clay loam, or silt loam
- Clay content—15 to 35 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—moderately saline or strongly saline

Bknz horizon:
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy clay loam, loam, clay loam, or silty clay loam
- Clay content—18 to 35 percent
- Reaction—neutral to moderately alkaline
- Calcium carbonate equivalent—10 to 20 percent

Bknyz horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—3 to 8, dry or moist
- Texture—gypsiferous loam, gypsiferous clay loam, gypsiferous silt loam, or gypsiferous silty clay loam
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline
- Calcium carbonate equivalent—10 to 30 percent
- Gypsum content—20 to 40 percent

Bkyz horizons:
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—3 to 8, dry or moist
Texture—gypsiferous sandy clay loam, gypsiferous loam, gypsiferous silt loam, clay loam, gypsiferous clay loam, or gypsiferous clay
Clay content—18 to 45 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—moderately saline or strongly saline
Calcium carbonate equivalent—10 to 30 percent
Gypsum content—6 to 35 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (Anz, Bknz, and Bknyz horizons)
- Salic horizon—the zone from 0 to 17.5 inches (Anz, Bknz, and Bknyz horizons)
- Gypsic horizon—the zone from 6.5 to 60 inches (Bknyz, Bkyz1, Bkyz2, and Bkyz3 horizons)

29—Gilland-Beach complex, 5 to 80 percent slopes

Map Unit Setting

Landform(s): Hills (fig. 34)
Elevation: 4,590 to 5,250 feet (1,400 to 1,600 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 61 to 64 degrees F (16.0 to 18.0 degrees C)
Mean annual soil temperature: 63 to 66 degrees F (17.1 to 19.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-3 Chihuahuan Desert Grassland

Map Unit Composition

Gilland and similar soils: 55 percent
Beach and similar soils: 35 percent
Minor components: 10 percent
   Haplocambids with a loamy-skeletal particle-size class and similar soils
   Riverwash
   Rock outcrop

Description of the Gilland Soil

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

Geomorphic position: Backslopes, footslopes, and toeslopes of sandstone and shale hills

Parent material: Residuum weathered from sandstone and shale

Slope: 5 to 35 percent

Surface cover
   Biological crust:
      cyanobacteria—0 percent
      lichen—0 percent
      moss—0 percent
      cryptogamic crust—0 percent
   Chemical crust:
      salt—0 percent
      gypsum—0 percent
   Physical cover:
      canopy plant cover—20 percent
      woody debris—3 percent
      bare soil—3 percent
      rock fragments—90 percent gravel and 2 percent cobbles

Depth to restrictive feature(s): 26 to 31 inches to lithic bedrock

Drainage class: Well drained

\[ K_{sat} \text{ (solum)} : 1.98 \text{ to } 5.95 \text{ inches per hour} (14.00 \text{ to } 42.00 \text{ micrometers per second}) \]

\[ K_{sat} \text{ (restrictive layer)} : 0.00 \text{ to } 0.06 \text{ inch per hour} (0.00 \text{ to } 0.42 \text{ micrometer per second}) \]

Available water capacity (total inches): 2.2 \( \text{(very low)} \)

Shrink-swell potential: About 2.3 LEP \( \text{(low)} \)

Flooding hazard: None

Runoff class: Medium

Hydrologic group: B

Ecological site name: Gravelly

Ecological site number: R042XC001NM

Present vegetation: American tarbush, threeawn, black grama, blue grama, cactus, creosotebush, ocotillo, and sideoats grama

Land capability classification \( \text{(nonirrigated areas)} \): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 30 minutes 34.70 seconds N. and long. 106 degrees 22 minutes 7.40 seconds W.

A—0 to 3 inches \( \text{(0 to 8 centimeters)} \); red \( \text{(2.5YR 4/6)} \) very gravelly loam, reddish brown \( \text{(2.5YR 4/4)} \) moist; 24 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine tubular pores; finely disseminated carbonate throughout; 25 percent gravel, 10 percent cobbles, and 5 percent stones; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.
Bk1—3 to 13 inches (8 to 33 centimeters); red (2.5YR 5/6) gravelly loam, red (2.5YR 4/6) moist; 25 percent clay; weak very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine tubular pores; common fine irregular carbonate masses throughout; 27 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

Bk2—13 to 20 inches (33 to 51 centimeters); red (2.5YR 5/6) extremely gravelly sandy clay loam, red (2.5YR 4/6) moist; 28 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; common very fine roots throughout; few very fine tubular pores; common fine irregular carbonate masses throughout; 62 percent gravel; violently effervescent, 19 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 2.5 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Bk3—20 to 28 inches (51 to 71 centimeters); red (2.5YR 5/6) extremely gravelly sandy clay loam, red (2.5YR 4/6) moist; 30 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; few very fine roots throughout; few very fine tubular pores; common fine irregular carbonate masses throughout; 80 percent gravel; strongly effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline; abrupt smooth boundary.

R—28 inches (71 centimeters); unweathered, unfractured, and indurated sandstone and shale.

Range in Characteristics

Clay content of control section (weighted average): 15 to 35 percent
Rock fragment content in control section: 15 to 85 percent

A horizon:
- Hue—2.5YR or 5YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—loam, sandy clay loam, or clay loam
- Clay content—15 to 30 percent
- Rock fragment content—25 to 85 percent
- Reaction—slightly alkaline or moderately alkaline

Bk horizons:
- Hue—2.5YR, 5YR, or 7.5YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy loam, loam, sandy clay loam, or clay loam
- Clay content—12 to 35 percent
- Rock fragment content—25 to 85 percent
- Calcium carbonate equivalent—15 to 40 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 3 inches (A horizon)
- Calcic horizon—the zone from 3 to 28 inches (Bk1, Bk2, and Bk3 horizons)
- Depth to lithic contact—28 inches (R horizon)
**Description of the Beach Soil**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, calcareous, thermic Lithic Ustic Torriorthents  
*Geomorphic position:* Shoulders and crests of sandstone and shale hills  
*Parent material:* Residuum weathered from sandstone and shale  
*Slope:* 10 to 80 percent  
*Surface cover*  
  - Biological crust:  
    - cyanobacteria—0 percent  
    - lichen—0 percent  
    - moss—0 percent  
    - cryptogamic crust—0 percent  
  - Chemical crust:  
    - salt—0 percent  
    - gypsum—0 percent  
  - Physical cover:  
    - canopy plant cover—15 percent  
    - woody debris—5 percent  
    - bare soil—5 percent  
    - rock fragments—85 percent gravel and 3 percent cobbles  
*Depth to restrictive feature(s):* 6 to 12 inches to lithic bedrock  
*Drainage class:* Well drained  
*\( K_{sat} \) (solum):* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)  
*\( K_{sat} \) (restrictive layer):* 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)  
*Available water capacity (total inches):* 0.7 (very low)  
*Shrink-swell potential:* About 1.3 LEP (low)  
*Flooding hazard:* None  
*Runoff class:* High  
*Hydrologic group:* D  
*Ecological site name:* Gravelly  
*Ecological site number:* R042XC001NM  
*Present vegetation:* Black grama, cactus, creosote bush, mesquite, and ocotillo  
*Land capability classification (nonirrigated areas):* 6c  

**Typical Pedon**  
*Location by Geographic Coordinate System:* lat. 33 degrees 30 minutes 24.00 seconds N. and long. 106 degrees 22 minutes 4.00 seconds W.  

**A—0 to 3 inches (0 to 8 centimeters):** reddish brown (5YR 4/4) very gravelly loam, dark reddish brown (5YR 3/4) moist; 22 percent clay; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots throughout; few very fine tubular pores; finely disseminated carbonate throughout; 40 percent gravel, 10 percent cobbles, and 1 percent stones; strongly effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 2.5 dS/m (mmhos/cm); very slightly saline; abrupt smooth boundary.  

**C—3 to 8 inches (8 to 20 centimeters):** reddish brown (5YR 4/4) very gravelly loam, dark reddish brown (5YR 3/4) moist; 22 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine tubular pores; few fine irregular carbonate masses throughout; 50 percent gravel; strongly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 2.9 dS/m (mmhos/cm); very slightly saline; abrupt irregular boundary.
R—8 inches (20 centimeters); unweathered, unfractured, and indurated sandstone and shale.

Range in Characteristics

Clay content of control section (weighted average): 15 to 30 percent
Rock fragment content in control section: 35 to 75 percent

A horizon:
- Hue—2.5YR or 5YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—loam, sandy clay loam, or clay loam
- Clay content—15 to 30 percent
- Rock fragment content—35 to 65 percent
- Reaction—slightly alkaline or moderately alkaline

C horizon:
- Hue—2.5YR or 5YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—loam or sandy clay loam
- Clay content—15 to 25 percent
- Rock fragment content—35 to 75 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and C horizons)
- Depth to lithic contact—8 inches (R horizon)

30—Globe-Jato-Peligro complex, 0 to 20 percent slopes

Map Unit Setting

Landform(s): Basin floors and dunes (fig. 35)
Elevation: 3,900 to 4,020 feet (1,190 to 1,225 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Globe and similar soils: 30 percent
Jato and similar soils: 30 percent
Peligro and similar soils: 30 percent
Minor components: 10 percent
- Basso and similar soils
- Loki and similar soils
- Najul and similar soils
- Nasa and similar soils
- Saltspring and similar soils
- Talos and similar soils
Description of the Globe Soil

**Taxonomic classification:** Fine, smectitic, thermic Chromic Haplotorrets

**Geomorphic position:** Playas and lower-lying interdunes between stabilized gypsum dunes

**Parent material:** Clayey alluvium

**Slope:** 0 to 1 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—40 percent
  - woody debris—20 percent
  - bare soil—55 percent
  - rock fragments—0 percent

**Drainage class:** Poorly drained

**$K_{sat}$ (solum):** 0.06 to 0.57 inch per hour (0.42 micrometer to 4.00 micrometers per second)

**Available water capacity (total inches):** 9.0 (high)

**Shrink-swell potential:** About 9.8 LEP (very high)

**Flooding hazard:** None

**Runoff class:** Negligible

**Hydrologic group:** C

**Ecological site name:** Clayey

Figure 35.—An area of map unit 30 (Globe-Jato-Peligro complex, 0 to 20 percent slopes).
Ecological site number: R042XB023NM
Present vegetation: Tobosa, honey mesquite, and fourwing saltbush
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 26 minutes 20.86 seconds N. and long. 106 degrees 24 minutes 43.34 seconds W.

A—0 to 8 inches (0 to 20 centimeters); brown (7.5YR 5/4) silty clay, brown (7.5YR 4/3) moist; 50 percent clay; moderate medium platy over moderate medium and coarse subangular blocky and moderate fine granular structure; hard, firm, slightly sticky, slightly plastic; common fine roots throughout; common fine tubular pores; finely disseminated carbonate throughout; violently effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bss—8 to 28 inches (20 to 71 centimeters); brown (7.5YR 5/4) silty clay, brown (7.5YR 4/3) moist; 45 percent clay; moderate coarse prismatic structure parting to strong medium and coarse angular blocky; extremely hard, very firm, very sticky, very plastic; common fine roots throughout; common fine tubular pores; few pressure faces on all faces of peds; few very fine irregular carbonate masses throughout; violently effervescent, 7 percent calcium carbonate equivalent and 1 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 2.5 dS/m (mmhos/cm); very slightly saline; gradual smooth boundary.

Bkss1—28 to 34 inches (71 to 86 centimeters); light brown (7.5YR 6/4) silty clay, brown (7.5YR 4/3) moist; 45 percent clay; moderate coarse prismatic structure parting to strong medium angular blocky; extremely hard, very firm, very sticky, very plastic; few pressure faces on all faces of peds; common fine threadlike carbonate masses throughout; violently effervescent, 7 percent calcium carbonate equivalent and 1 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; gradual smooth boundary.

Bkss2—34 to 60 inches (86 to 152 centimeters); light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 4/4) moist; 35 percent clay; moderate coarse prismatic structure parting to strong medium angular blocky; moderately hard, firm, slightly sticky, slightly plastic; few pressure faces on all faces of peds; common fine threadlike carbonate masses throughout; violently effervescent, 10 percent calcium carbonate equivalent and 1 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.6 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Soil cracks: Many vertical cracks 0.25 to 0.50 inch wide from the surface to a depth of 30 inches
Clay content of control section (weighted average): 40 to 50 percent

A horizon:
Hue—7.5YR or 10YR
Value—4 to 5 dry; 3 to 4 moist
Chroma—2 to 4, dry or moist
Texture—silt loam, silty clay loam, or silty clay
Clay content—20 to 50 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline or very slightly saline

Bss horizon:
Hue—7.5YR or 10YR
Value—4 to 5 dry; 3 to 4 moist
Chroma—2 to 4, dry or moist
Texture—silty clay or clay
Clay content—40 to 50 percent
Salinity—nonsaline or very slightly saline

*Bkss* horizons:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—silty clay loam, silty clay, or clay
- Clay content—35 to 50 percent
- Salinity—very slightly saline or slightly saline
- Calcium carbonate equivalent—5 to 25 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (A horizon)
- Slickensides—the zone from 8 to 60 inches (Bss, Bkss1, and Bkss2 horizons)

**Description of the Jato Soil**

*Taxonomic classification:* Loamy over coarse-gypseous, mixed over hypergypsic, superactive, thermic Typic Calcigypsids

*Geomorphic position:* Level interdunes between stabilized gypsum dunes

*Parent material:* Fine-silty alluvium over gypsiferous lacustrine deposits

*Slope:* 0 to 3 percent

*Surface cover*
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—8 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—83 percent
  - woody debris—17 percent
  - bare soil—23 percent
  - rock fragments—0 percent

*Depth to restrictive feature(s):* 35 to 39 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*K*<sub>sat</sub> (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

*Available water capacity (total inches):* 6.4 (moderate)

*Shrink-swell potential:* About 2.7 LEP (low)

*Flooding hazard:* None

*Runoff class:* Low

*Hydrologic group:* B

*Ecological site name:* Loamy

*Ecological site number:* R042XB014NM

*Present vegetation:* Tobosa, bush muhly, burrograss, and fourwing saltbush

*Land capability classification (nonirrigated areas):* 7c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 32 degrees 25 minutes 29.58 seconds N. and long. 106 degrees 27 minutes 3.29 seconds W.
A—0 to 2 inches (0 to 5 centimeters); brown (7.5YR 5/3) fine sandy loam, dark brown (7.5YR 3/4) moist; 14 percent clay; moderate medium platy structure; soft, very friable, nonsticky, nonplastic; few fine and medium and common very fine roots throughout; few medium irregular pores; finely disseminated carbonate throughout; strongly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 2.6 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Bw—2 to 5 inches (5 to 13 centimeters); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/3) moist; 16 percent clay; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium and common very fine roots throughout; few very fine irregular pores; finely disseminated carbonate throughout; strongly effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.

Bk1—5 to 17 inches (13 to 43 centimeters); brown (7.5YR 5/3) silt loam, dark brown (7.5YR 4/3) moist; 20 percent clay; moderate fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine, fine, and medium roots throughout; few very fine and medium irregular carbonate masses throughout; violently effervescent, 11 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

Bk2—17 to 23 inches (43 to 58 centimeters); brown (7.5YR 5/3) silt loam, brown (7.5YR 4/3) moist; 22 percent clay; moderate fine and medium subangular blocky structure; moderately hard, friable, nonsticky, nonplastic; few very fine, fine, and medium roots throughout; few fine irregular pores; common fine spherical and few fine threadlike carbonate masses throughout; violently effervescent, 18 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Bk3—23 to 37 inches (58 to 94 centimeters); light brown (7.5YR 6/3) silt loam, brown (7.5YR 5/3) moist; 22 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine and fine roots throughout; few very fine irregular pores; common fine and medium irregular carbonate masses throughout; violently effervescent, 33 percent calcium carbonate equivalent and 1 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 3.6 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

Byy1—37 to 56 inches (94 to 142 centimeters); white (10YR 9/1) gypsiferous sandy loam, white (10YR 8.5/1) moist; 12 percent clay; moderate medium subangular blocky structure; very hard, firm, nonsticky, nonplastic; few fine roots throughout; few fine irregular pores; finely disseminated carbonate, many fine irregular gypsum crystals, and common fine irregular gypsum masses throughout; violently effervescent, 17 percent calcium carbonate equivalent and 69 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

Byy2—56 to 60 inches (142 to 152 centimeters); white (10YR 8.5/1) gypsiferous sandy loam, white (10YR 8/1) moist; 10 percent clay; weak medium subangular blocky structure; extremely hard, very firm, nonsticky, nonplastic; finely disseminated carbonate, many fine irregular gypsum crystals, and common fine irregular gypsum masses throughout; violently effervescent, 16 percent calcium carbonate equivalent and 55 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 6.0 dS/m (mmhos/cm); slightly saline.
Range in Characteristics

Clay content of control section (weighted average): 18 to 29 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—fine sandy loam, sandy loam, sandy clay loam, loam, or silt loam
- Clay content—14 to 28 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

Bw horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—fine sandy loam, loam, or silt loam
- Clay content—10 to 26 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline to slightly saline

Bk horizons:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—loam, clay loam, silt loam, or silty clay loam
- Clay content—18 to 29 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline
- Calcium carbonate equivalent—10 to 25 percent

Byy horizons:
- Hue—7.5YR, 10YR, or 2.5Y
- Value—7 to 9 dry; 6 to 8.5 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous loam
- Clay content—4 to 17 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline
- Gypsum content—50 to 90 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A, Bw, and Bk1 horizons)
- Calcic horizon—the zone from 17 to 37 inches (Bk2 and Bk3 horizons)
- Gypsic horizon—the zone from 37 to 60 inches (Byy1 and Byy2 horizons)
- Depth to strongly contrasting particle-size class—37 inches (loamy over coarse-gypseous)

Description of the Peligro Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: Gently sloping or moderately sloping stabilized gypsum dunes
Parent material: Gypsiferous sandy eolian deposits
Slope: 0 to 20 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
lichen—0 percent  
moss—0 percent  
cryptogamic crust—60 percent

Chemical crust:  
salt—0 percent  
gypsum—18 percent

Physical cover:  
canopy plant cover—10 percent  
woody debris—10 percent  
bare soil—20 percent  
rock fragments—0 percent

Drainage class: Excessively drained

\( K_{\text{sat}} \) (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity (total inches): 3.8 (low)

Shrink-swell potential: About 1.1 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: A

Ecological site name: Gyp Outcrop

Ecological site number: R042XB007NM

Present vegetation: Gyp dropseed, hairy coldenia, alkali sacaton, and fourwing saltbush

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 27 minutes 3.31 seconds N. and long. 106 degrees 23 minutes 17.95 seconds W.

Ayy—0 to 4 inches (0 to 10 centimeters); white (10YR 8/1) gypsiferous sandy loam, very pale brown (10YR 7/3) moist; 10 percent clay; moderate thick platy structure parting to moderate medium subangular blocky; slightly hard, friable, nonsticky, nonplastic; few very fine and fine roots throughout; few fine irregular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; strongly effervescent, 4 percent calcium carbonate equivalent and 72 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.2 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Byy1—4 to 10 inches (10 to 25 centimeters); pale orange yellow (10YR 9/2) gypsiferous loamy sand, very pale brown (10YR 8.5/2) moist; 5 percent clay; weak very coarse prismatic and weak coarse subangular blocky structure; hard, very firm, nonsticky, nonplastic; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 94 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.2 dS/m (mmhos/cm); very slightly saline; diffuse wavy boundary.

Byy2—10 to 31.5 inches (25 to 80 centimeters); very pale brown (10YR 8.5/2) gypsiferous loamy sand, very pale brown (10YR 8/2) moist; 3 percent clay; weak very coarse prismatic structure; hard, very firm, nonsticky, nonplastic; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 86 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; diffuse wavy boundary.

Cyy—31.5 to 60 inches (80 to 152 centimeters); white (10YR 8.5/1) gypsiferous loamy coarse sand, white (10YR 8/1) moist; 3 percent clay; massive; hard, very firm, nonsticky, nonplastic; finely disseminated carbonate and many medium platy gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 86 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; diffuse wavy boundary.
equivalent and 83 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 3.6 dS/m (mmhos/cm); very slightly saline.

**Range in Characteristics**

*Clay content of control section (weighted average): 4 to 8 percent*

**Ayy horizon:**
- Hue—7.5YR, 10YR, or 2.5Y
- Value—6 to 9 dry; 5 to 8.5 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous coarse sand, gypsiferous loamy coarse sand, gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous loam
- Clay content—7 to 13 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline
- Gypsum content—70 to 95 percent

**Byy horizons:**
- Hue—10YR or 2.5Y
- Value—7 to 9 dry; 6 to 8.5 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous loamy coarse sand, gypsiferous loamy sand, or gypsiferous sandy loam
- Clay content—2 to 10 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline
- Gypsum content—70 to 95 percent

**Cyy horizon:**
- Hue—10YR or 2.5Y
- Value—7 to 9 dry; 6 to 8.5 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous coarse sand, gypsiferous loamy coarse sand, gypsiferous sand, or gypsiferous loamy sand
- Clay content—2 to 6 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline
- Gypsum content—70 to 95 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 4 inches (Ayy horizon)
- Gypsic horizon—the zone from 10 to 31.5 inches (Byy1 and Byy2 horizons)

**31—Globe-Typic Haplocalcids complex, 0 to 1 percent slopes**

**Map Unit Setting**

*Landform(s):* Basin floors (fig. 36)
*Elevation:* 3,910 to 3,920 feet (1,191 to 1,194 meters)
*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)
*Mean annual air temperature:* 64 to 70 degrees F (18.0 to 21.0 degrees C)
*Mean annual soil temperature:* 66 to 72 degrees F (19.1 to 22.1 degrees C)
*Frost-free period:* 180 to 240 days
*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains
*Land Resource Unit:* 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Globe and similar soils: 75 percent
Typic Haplocalcids and similar soils: 20 percent
Minor components: 5 percent
   Copia and similar soils
   Mcnew and similar soils
   Pajarito and similar soils
   Water

Description of the Globe Soil

*Taxonomic classification:* Fine, smectitic, thermic Chromic Haplotorrerts
*Geomorphic position:* Playas
*Parent material:* Clayey alluvium
*Slope:* 0 to 1 percent
*Surface cover*
   Biological crust:
      cyanobacteria—0 percent
      lichen—0 percent
      moss—0 percent
      cryptogamic crust—0 percent
   Chemical crust:
      salt—0 percent
      gypsum—0 percent
*Physical cover:*
   canopy plant cover—40 percent
   woody debris—20 percent

Figure 36.—An area of map unit 31 (Globe-Typic Haplocalcids complex, 0 to 1 percent slopes).
bare soil—55 percent
rock fragments—0 percent

**Drainage class:** Poorly drained

\( K_{sat} (solum): 0.06 \text{ inch to 1.98 inches per hour (0.42 micrometer to 14.00 micrometers per second)} \)

**Available water capacity (total inches):** 9.3 (high)

**Shrink-swell potential:** About 10.9 LEP (very high)

**Flooding hazard:** None

**Runoff class:** Negligible

**Hydrologic group:** C

**Ecological site name:** Clayey

**Ecological site number:** R042XB023NM

**Present vegetation:** Common spikerush, alkali sacaton, and cocklebur

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 32 degrees 21 minutes 16.62 seconds N. and long. 106 degrees 23 minutes 51.78 seconds W.

A—0 to 3 inches (0 to 7 centimeters); brown (7.5YR 4/3) silty clay loam, dark brown (7.5YR 3/2) moist; 30 percent clay; moderate medium platy over moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine and few fine roots throughout; common very fine and fine dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bw—3 to 8.5 inches (7 to 22 centimeters); brown (7.5YR 4/3) clay loam, dark brown (7.5YR 3/3) moist; 35 percent clay; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bkss1—8.5 to 18.5 inches (22 to 47 centimeters); dark brown (7.5YR 3/4) clay, dark brown (7.5YR 3/3) moist; 50 percent clay; moderate very coarse prismatic structure parting to moderate coarse angular blocky; very hard, extremely firm, slightly sticky, slightly plastic; few fine and medium and common very fine roots throughout; few very fine dendritic tubular pores; few distinct pressure faces on all faces of peds and few distinct slickensides (pedogenic) on vertical faces of peds; common fine irregular carbonate masses throughout; 2 percent fine gravel; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Bkss2—18.5 to 38 inches (47 to 96 centimeters); brown (7.5YR 4/4) clay, brown (7.5YR 4/3) moist; 55 percent clay; moderate very coarse prismatic structure parting to moderate coarse angular blocky; very hard, extremely firm, moderately sticky, moderately plastic; few very fine and fine roots throughout; few very fine dendritic tubular pores; few distinct pressure faces on all faces of peds and few distinct slickensides (pedogenic) on vertical faces of peds; common fine irregular carbonate masses throughout; 2 percent fine gravel; violently effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bkss3—38 to 56.5 inches (96 to 143 centimeters); 30 percent light brownish gray (2.5Y 6/2) and 70 percent brown (7.5YR 4/4) clay, 30 percent grayish brown (2.5Y
5/2) and 70 percent brown (7.5YR 4/3) moist; 55 percent clay; moderate very coarse prismatic structure parting to moderate coarse angular blocky; very hard, extremely firm, moderately sticky, moderately plastic; few very fine and few fine roots throughout; few distinct pressure faces on all faces of peds and few distinct slickensides (pedogenic) on vertical faces of peds; common medium irregular carbonate masses throughout; 2 percent fine gravel; violently effervescent, 14 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bkss4—56.5 to 60 inches (143 to 152 centimeters); 30 percent light brownish gray (2.5Y 6/2) and 70 percent brown (7.5YR 4/4) clay, 30 percent grayish brown (2.5Y 5/2) and 70 percent brown (7.5YR 4/3) moist; 55 percent clay; moderate very coarse prismatic structure parting to moderate coarse angular blocky; very hard, extremely firm, moderately sticky, moderately plastic; few very fine roots throughout; few distinct pressure faces on all faces of peds and few distinct slickensides (pedogenic) on vertical faces of peds; common coarse irregular carbonate masses throughout; 2 percent fine gravel; violently effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

**Clay content of control section (weighted average): 45 to 60 percent**

**A horizon:**
- Hue—7.5YR or 10YR
- Value—3 to 4 dry; 2.5 to 3 moist
- Chroma—1 to 3, dry or moist
- Texture—loam, silt loam, clay loam, or silty clay loam
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline

**Bw horizon:**
- Hue—7.5YR or 10YR
- Value—3 to 4 dry; 2.5 to 3 moist
- Chroma—1 to 3, dry or moist
- Texture—clay loam or clay
- Clay content—28 to 45 percent
- Reaction—slightly alkaline or moderately alkaline

**Bkss horizons:**
- Hue—7.5YR, 10YR, or 2.5Y
- Value—3 to 6 dry; 3 to 5 moist
- Chroma—2 to 4, dry or moist
- Clay content—45 to 60 percent
- Reaction—slightly alkaline or moderately alkaline

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 3 to 8.5 inches (Bw horizon)
- Slickensides—the zone from 8.5 to 60 inches (Bkss1, Bkss2, Bkss3, and Bkss4 horizons)

**Description of the Typic Haplocalcids**

*Taxonomic classification:* Typic Haplocalcids

*Geomorphic position:* Playas

*Parent material:* Fine-loamy alluvium

*Slope:* 0 to 1 percent
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Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—3 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—45 percent
- woody debris—23 percent
- bare soil—35 percent
- rock fragments—0 percent

Drainage class: Well drained

$K_{sat}$ (solum): 0.20 inch to 19.98 inches per hour (1.40 to 141.00 micrometers per second)

Available water capacity (total inches): 8.4 (high)

Shrink-swell potential: About 8.0 LEP (high)

Flooding hazard: None

Runoff class: Negligible

Hydrologic group: C

Ecological site name: Limy

Ecological site number: R042XB019NM

Present vegetation: Carpet verbena and blueweed sunflower

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 20 minutes 48.62 seconds N. and long. 106 degrees 23 minutes 58.28 seconds W.

A—0 to 6 inches (0 to 15 centimeters); dark reddish gray (5YR 4/2) loam, dark reddish brown (5YR 3/2) moist; 25 percent clay; moderate thick and very thick platy structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine and few fine roots throughout; common very fine, fine, and medium dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk1—6 to 13 inches (15 to 33 centimeters); light reddish brown (5YR 6/3) clay loam, reddish brown (5YR 4/3) moist; 30 percent clay; moderate fine and medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; many very fine and few fine roots throughout; few fine dendritic tubular pores; common fine spherical and common medium irregular carbonate masses throughout; strongly effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk2—13 to 20 inches (33 to 51 centimeters); light gray (2.5Y 7/2) gravelly sandy clay loam, light brownish gray (2.5Y 6/2) moist; 30 percent clay; moderate coarse subangular blocky structure; moderately hard, firm, very sticky, very plastic; many very fine and common fine roots throughout; common very fine and few fine dendritic tubular pores; 3 percent medium and 5 percent fine masses of reduced iron throughout; common medium and coarse irregular carbonate masses throughout; 20 percent fine gravel; violently effervescent, 27 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.
Bk3—20 to 30.5 inches (51 to 77 centimeters); pale yellow (2.5Y 7/3) clay loam, light yellowish brown (2.5Y 6/3) moist; 34 percent clay; moderate fine and medium subangular blocky structure; moderately hard, firm, very sticky, very plastic; many very fine and few fine roots throughout; few medium and common fine dendritic tubular pores; 3 percent medium and 5 percent fine masses of reduced iron throughout; many very coarse irregular carbonate masses throughout; 5 percent fine gravel; violently effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; very abrupt wavy boundary.

Bk4—30.5 to 41.5 inches (77 to 106 centimeters); light gray (2.5Y 7/2) sandy clay, light yellowish brown (2.5Y 6/4) moist; 48 percent clay; strong medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, extremely firm, very sticky, very plastic; few fine roots throughout; few very fine and fine dendritic tubular pores; 3 percent medium and 5 percent fine masses of reduced iron throughout; common fine and medium irregular carbonate masses throughout; strongly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

2Bk—41.5 to 55 inches (106 to 140 centimeters); light yellowish brown (2.5Y 6/4) very gravelly coarse sandy loam, light olive brown (2.5Y 5/4) moist; 8 percent clay; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine roots throughout; common medium irregular carbonate masses throughout; 40 percent fine gravel; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

3Bk—55 to 60 inches (140 to 152 centimeters); pale yellow (2.5Y 7/3) sandy clay, light yellowish brown (2.5Y 6/4) moist; 45 percent clay; strong coarse angular blocky structure; very hard, extremely firm, very sticky, very plastic; few very fine roots throughout; few very fine and fine dendritic tubular pores; 5 percent fine masses of reduced iron on surfaces along root channels; common coarse irregular carbonate masses throughout; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Note: Typic Haplocalcids have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 27 to 50 percent
Other characteristics: Some pedons do not have a 3Bk horizon

A horizon:
  Hue—5YR or 7.5YR
  Value—3 to 5 dry; 3 to 4 moist
  Chroma—2 to 4, dry or moist
  Texture—loam or silt loam
  Clay content—18 to 27 percent

Bk horizons:
  Hue—5YR, 7.5YR, 10YR, or 2.5Y
  Value—5 to 7 dry; 4 to 6 moist
  Chroma—2 to 6, dry or moist
  Texture—sandy clay loam, clay loam, silty clay loam, or sandy clay
  Clay content—27 to 48 percent
  Calcium carbonate equivalent—5 to 30 percent
2Bk and 3Bk horizons:
- Hue—5YR, 7.5YR, 10YR, or 2.5Y
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—3 to 4, dry or moist
- Texture—sand, fine sand, coarse sandy loam, sandy loam, fine sandy loam, or sandy clay
- Clay content—0 to 45 percent
- Calcium carbonate equivalent—5 to 10 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 6 inches (A horizon)
- Calcic horizon—the zone from 6 to 20 inches (Bk1 and Bk2 horizons)

32—Gyplaya gypsiferous sand, 0 to 4 percent slopes

Map Unit Setting

Landform(s): Playas (fig. 37)
Elevation: 3,950 to 4,100 feet (1,203 to 1,251 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Gyplaya and similar soils: 98 percent
Minor components: 2 percent
Gypsic Aquisalids with a fine or fine-loamy particle-size class and similar soils

**Description of the Gyplaya Soil**

*Taxonomic classification:* Sandy, hypergypsic, thermic Typic Aquisalids
*Geomorphic position:* All areas of gypsiferous-saline playas
*Parent material:* Gypsiferous eolian sands
*Slope:* 0 to 4 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—100 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—2 percent
  - woody debris—0 percent
  - bare soil—0 percent
  - rock fragments—0 percent

**Depth to restrictive feature(s):** 0 inches to salic horizon

*Drainage class:* Somewhat poorly drained
*K*<sub>sat</sub> (solum): 1.98 to 99.92 inches per hour (14.00 to 705.00 micrometers per second)
*Available water capacity (total inches):* 0.0 (very low)
*Shrink-swell potential:* About 0.9 LEP (low)
*Flooding hazard:* None
*Depth to seasonal high water table (minimum):* About 0 inches
*Runoff class:* Negligible
*Hydrologic group:* A/D

**Ecological site name:** Gyp Playa
**Ecological site number:** R042XB008NM
**Present vegetation:** Iodinebush and glasswort
**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon** (fig. 38)

*Location by Geographic Coordinate System*: lat. 32 degrees 58 minutes 11.58 seconds N. and long. 106 degrees 14 minutes 58.70 seconds W.

Anyyz—0 to 0.5 inch (0 to 1 centimeter); light brownish gray (10YR 6/2) gypsiferous sand, dark yellowish brown (10YR 4/4) moist; 2 percent clay; moderate thin platy structure; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; finely disseminated salt and many medium irregular gypsum crystals throughout; noneffervescent, 73 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 150.0 dS/m (mmhos/cm); strongly saline; very abrupt smooth boundary.

Cnyyz1—0.5 inch to 6 inches (1 to 15 centimeters); white (10YR 8.5/1) gypsiferous loamy fine sand, white (10YR 8/1) moist; 6 percent clay; weak very thin platy structure; soft, very friable, nonsticky, nonplastic; many very fine irregular and common fine tubular pores; many fine irregular gypsum crystals and common very fine irregular salt crystals throughout; noneffervescent, 84 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 59.0 dS/m (mmhos/cm); strongly saline; clear wavy boundary.
Cnyyz2—6 to 26 inches (15 to 66 centimeters); 10 percent yellow (10YR 7/6) and 90 percent white (10YR 9.5/1) gypsiferous fine sand, 10 percent brownish yellow (10YR 6/6) and 90 percent white (10YR 9/1) moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; common fine and medium tubular and many very fine irregular pores; finely disseminated salt and many fine irregular gypsum crystals throughout; noneffervescent, 92 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 50.0 dS/m (mmhos/cm); strongly saline; clear wavy boundary.

Cnyyz3—26 to 60 inches (66 to 152 centimeters); white (2.5Y 9.5/1) gypsiferous fine sand, white (2.5Y 9/1) moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; common fine and medium tubular and many very fine irregular pores; finely disseminated salt and many fine irregular gypsum crystals throughout; noneffervescent, 94 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 52.0 dS/m (mmhos/cm); strongly saline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 2 to 6 percent

*Anyyz horizon:*
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—gypsiferous sand, gypsiferous loamy fine sand, or gypsiferous sandy loam
- Clay content—1 to 8 percent
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Reaction—slightly alkaline or moderately alkaline
Gypsum content—65 to 90 percent

Cnnyyz horizons:
Hue—10YR or 2.5Y
Value—7 to 9.5 dry; 6 to 9 moist
Chroma—1 to 6, dry or moist
Texture—gypsiferous fine sand, gypsiferous loamy fine sand, or gypsiferous sandy loam
Clay content—2 to 8 percent
Reaction—slightly alkaline or moderately alkaline
Gypsum content—70 to 95 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 0.5 inch (Anyyz horizon)
• Salic horizon—the zone from 0 to 60 inches (Anyyz, Cnnyyz1, Cnnyyz2, and Cnnyyz3 horizons)
• Endosaturation—the zone from 10 to 60 inches

33—Gypsic Aquisalids silty clay loam, 0 to 1 percent slopes

Map Unit Setting

Landform(s): Basin floors (fig. 39)
Elevation: 3,950 to 4,090 feet (1,203 to 1,248 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Gypsic Aquisalids and similar soils: 95 percent
Minor components: 5 percent
Astrobee and similar soils
Gypsic Haplosalids and similar soils
Hembrillo and similar soils
Lark and similar soils
Nasa and similar soils
Shot and similar soils
Transformer and similar soils
Yesum and similar soils
Water

Description of the Gypsic Aquisalids

Taxonomic classification: Gypsic Aquisalids
Geomorphic position: All areas of gypsiferous saline playas
Parent material: Clayey alluvium over gypsiferous alluvium
Slope: 0 to 1 percent
Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent
Chemical crust:
salt—20 percent
gypsum—0 percent
Physical cover:
canopy plant cover—5 percent
woody debris—0 percent
bare soil—80 percent
rock fragments—0 percent
Depth to restrictive feature(s): 0 to 2 inches to salic horizon
Drainage class: Poorly drained
$K_{sat}$ (solum): 0.57 inch to 1.98 inches per hour (4.00 to 14.00 micrometers per second)
Available water capacity (total inches): 0.0 (very low)
Shrink-swell potential: About 4.7 LEP (moderate)
Flooding hazard: None
Depth to seasonal high water table (minimum): About 0 to 40 inches
Runoff class: Negligible
Hydrologic group: C
Ecological site name: Salt Flats
Ecological site number: R042XB036NM
Present vegetation: Iodinebush and pickleweed
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 52 minutes 50.26 seconds N. and long. 106 degrees 9 minutes 14.91 seconds W.
Anyz—0 to 2 inches (0 to 5 centimeters); brown (7.5YR 5/3) gypsiferous silty clay loam, brown (7.5YR 4/4) moist; 32 percent clay; moderate medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; finely disseminated carbonate, gypsum, and salt throughout; slightly effervescent, 1 percent calcium carbonate equivalent and 48 percent gypsum; moderately alkaline, pH 8.4; electrical conductivity of 124.0 dS/m (mmhos/cm); strongly saline; clear wavy boundary.

Bknyz—2 to 24 inches (5 to 61 centimeters); strong brown (7.5YR 5/6) gypsiferous clay, dark brown (7.5YR 3/3) moist; 50 percent clay; moderate medium subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; finely disseminated gypsum and salt throughout and common medium and coarse irregular carbonate masses on faces of peds; violently effervescent, 15 percent calcium carbonate equivalent and 23 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 141.0 dS/m (mmhos/cm); strongly saline; abrupt smooth boundary.

2Cnyz—24 to 36 inches (61 to 91 centimeters); 5 percent strong brown (7.5YR 4/6) and 95 percent very pale brown (10YR 8/2) gypsiferous sandy loam, 5 percent reddish brown (5YR 4/4) and 95 percent light gray (10YR 7/2) moist; 14 percent clay; massive; moderately hard, firm, nonsticky, nonplastic; finely disseminated salt, common medium irregular gypsum masses, and many very fine irregular gypsum crystals throughout; noneffervescent, 34 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 206.0 dS/m (mmhos/cm); strongly saline; abrupt smooth boundary.

3Cnyyz—36 to 60 inches (91 to 152 centimeters); 2 percent brown (7.5YR 5/4) and 98 percent gray (10YR 6/1) gypsiferous sandy loam, 2 percent yellowish red (5YR 4/6) and 98 percent gray (10YR 5/1) moist; 12 percent clay; massive; very hard, very firm, nonsticky, nonplastic; finely disseminated salt, common medium irregular gypsum masses, and many very fine irregular gypsum crystals throughout; noneffervescent, 65 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 184.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Note: Gypsic Aquisalids have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 10 to 60 percent

Anyz horizon:
Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 4 moist
Chroma—2 to 4, dry or moist
Texture—gypsiferous silt loam, gypsiferous silty clay loam, gypsiferous clay loam, or gypsiferous clay
Clay content—20 to 60 percent
Gypsum content—15 to 60 percent

Bknyz horizon:
Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 4 moist
Chroma—2 to 6, dry or moist
Texture—gypsiferous silty clay or gypsiferous clay
Clay content—40 to 60 percent
Gypsum content—15 to 40 percent

2Cnyz horizon (if it occurs):
Hue—5YR, 7.5YR, 10YR, or 2.5Y
Value—4 to 9 dry; 4 to 8 moist
Chroma—2 to 6, dry or moist
Texture—gypsiferous sandy loam, gypsiferous loam, or gypsiferous silt loam
Clay content—10 to 20 percent
Gypsum content—15 to 40 percent

3Cnyyz horizon (if it occurs):
Hue—5YR, 7.5YR, 10YR, or 2.5Y
Value—5 to 9 dry; 4 to 8 moist
Chroma—1 to 6, dry or moist
Texture—gypsiferous sandy loam, gypsiferous loam, or gypsiferous silt loam
Clay content—10 to 20 percent
Gypsum content—40 to 80 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 2 inches (Anyz horizon)
• Gypsic horizon—the zone from 2 to 60 inches (Bknyz, 2Cnyz, and 3Cnyyz horizons)
• Salic horizon—the zone from 0 to 60 inches (Anyz, Bknyz, 2Cnyz, and 3Cnyyz horizons)

34—Gypsic Haplosalids silty clay loam, 0 to 5 percent slopes

Map Unit Setting

Landform(s): Alluvial flats (fig. 40)
Elevation: 4,000 to 4,400 feet (1,219 to 1,342 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Gypsic Haplosalids and similar soils: 95 percent
Minor components: 5 percent
  Aerobee and similar soils
  Malpaispring and similar soils
  Nasa and similar soils
  Pup and similar soils
  Slickcity and similar soils
  Yesum and similar soils

Description of the Gypsic Haplosalids

Taxonomic classification: Gypsic Haplosalids
Geomorphic position: Alluvial flats
Parent material: Fine-silty alluvium over gypsiferous lacustrine deposits
Slope: 0 to 5 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
Chemical crust:
- salt—3 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—15 percent
- woody debris—10 percent
- bare soil—80 percent
- rock fragments—0 percent

Depth to restrictive feature(s): 4 to 10 inches to salic horizon

Drainage class: Well drained

$K_{sat}$ (solum): 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity (total inches): 0.6 (very low)

Shrink-swell potential: About 2.7 LEP (low)

Flooding hazard: Rare

Runoff class: Negligible

Hydrologic group: C

Ecological site name: Salt Flats

Ecological site number: R042XB036NM

Present vegetation: Alkali sacaton, fourwing saltbush, desert seepweed, and iodinebush

Land capability classification (nonirrigated areas): 7c

**Typical Pedon** (fig. 41)

Location by Geographic Coordinate System: lat. 33 degrees 16 minutes 27.18 seconds N. and long. 106 degrees 18 minutes 12.41 seconds W.

Anyz—0 to 2 inches (0 to 5 centimeters); brown (7.5YR 4/4) gypsiferous silty clay loam, brown (7.5YR 4/3) moist; 29 percent clay; weak thick platy over weak medium subangular blocky structure; slightly hard, friable, moderately sticky,
moderately plastic; few very fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate and salt and common very fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 17 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 33.1 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

Byyz—2 to 6 inches (5 to 15 centimeters); pink (7.5YR 8/3) gypsiferous loamy sand, reddish yellow (7.5YR 6/6) moist; 5 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots

Figure 41.—Representative profile of the Gypsic Haplosalids silty clay loam in map unit 34 (Gypsic Haplosalids silty clay loam, 0 to 5 percent slopes). Scale is in inches.
throughout; few very fine dendritic tubular pores; finely disseminated salt and
many fine irregular gypsum crystals throughout; noneffervescent, 78 percent
gypsum; moderately alkaline, pH 8.1; electrical conductivity of 13.1 dS/m (mmhos/
cm); moderately saline; abrupt wavy boundary.

Bnyyz1—6 to 12 inches (15 to 30 centimeters); pinkish gray (7.5YR 7/2) gypsic
loam, brown (7.5YR 5/3) moist; 15 percent clay; moderate medium subangular
blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine and very
course roots throughout; few very fine dendritic tubular pores; finely disseminated
salt, many fine irregular gypsum crystals, and common very fine irregular gypsum
crystal clusters throughout; noneffervescent, 71 percent gypsum; moderately
alkaline, pH 8.1; electrical conductivity of 56.9 dS/m (mmhos/cm); strongly saline;
clear wavy boundary.

Bnyyz2—12 to 21.5 inches (30 to 55 centimeters); light gray (7.5YR 7/1) gypsic
loam, pink (7.5YR 7/4) moist; 11 percent clay; moderate medium subangular
blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots
throughout; few very fine dendritic tubular pores; finely disseminated salt, many
fine irregular gypsum crystals, and common very fine irregular gypsum crystal
clusters throughout; noneffervescent, 82 percent gypsum; slightly alkaline, pH
7.8; electrical conductivity of 80.2 dS/m (mmhos/cm); strongly saline; clear wavy
boundary.

Bnyyz3—21.5 to 39.5 inches (55 to 100 centimeters); light gray (2.5Y 7/2) gypsic
loam, light yellowish brown (2.5Y 6/4) moist; 10 percent clay; moderate medium
subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few
very fine and fine roots throughout; few very fine dendritic tubular pores; finely
disseminated salt, many fine irregular gypsum crystals, and common very fine
irregular gypsum crystal clusters throughout; noneffervescent, 78 percent gypsum;
slightly alkaline, pH 7.6; electrical conductivity of 52.5 dS/m (mmhos/cm); strongly
saline; clear wavy boundary.

Bnyyz4—39.5 to 47 inches (100 to 120 centimeters); white (7.5YR 8/1) gypsic
loam, pinkish gray (7.5YR 6/2) moist; 14 percent clay; moderate medium
subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few
very fine roots throughout; few very fine dendritic tubular pores; finely disseminated
salt, many fine irregular gypsum crystals, and common very fine irregular gypsum
crystal clusters throughout; noneffervescent, 82 percent gypsum; slightly alkaline,
pH 7.7; electrical conductivity of 55.4 dS/m (mmhos/cm); strongly saline; abrupt
wavy boundary.

Bnyyz5—47 to 55 inches (120 to 140 centimeters); gray (7.5YR 6/1) gypsic
loam, very dark gray (7.5YR 3/1) moist; 13 percent clay; moderate medium subangular
blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots
throughout; finely disseminated salt, many fine irregular gypsum crystals, and
many very fine irregular gypsum crystal clusters throughout; noneffervescent, 77
percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 35.2 dS/m
(mmmhos/cm); strongly saline; abrupt wavy boundary.

B’yyz—55 to 60 inches (140 to 152 centimeters); white (10YR 8/1) gypsic
loam, very pale brown (10YR 7/3) moist; 15 percent clay; moderate medium subangular
blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots
throughout; few very fine dendritic tubular pores; finely disseminated salt, many
fine irregular gypsum crystals, and common very fine irregular gypsum crystal
clusters throughout; noneffervescent, 85 percent gypsum; slightly alkaline, pH 7.8;
electrical conductivity of 22.1 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Note: Gypsic Haplsoalids have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 10 to 20 percent
Anyz horizon:
Hue—5YR, 7.5YR, or 10YR
Value—4 to 8 dry; 3 to 7 moist
Chroma—3 to 6, dry or moist
Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, gypsiferous very fine sandy loam, gypsiferous loam, silt, silt loam, silty clay loam, or gypsiferous silty clay loam
Clay content—10 to 36 percent
Gypsum content—10 to 95 percent
Reaction—slightly alkaline or moderately alkaline

Byyz, Bnyyz, and B’yzz horizons:
Hue—5YR, 7.5YR, 10YR, or 2.5Y
Value—4 to 9 dry; 3 to 8 moist
Chroma—1 to 6, dry or moist
Texture—gypsiferous loamy sand, gypsiferous fine sandy loam, gypsiferous very fine sandy loam, gypsiferous loam, or gypsiferous silt loam
Clay content—5 to 20 percent
Gypsum content—60 to 95 percent
Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 2 inches (Anyz horizon)
• Gypsic horizon—the zone from 2 to 60 inches (Bnyyz1, Bnyyz2, Bnyyz3, Bnyyz4, Bnyyz5, and B’yzz horizons)
• Salic horizon—the zone from 0 to 55 inches (Anyz, Bnyyz1, Bnyyz2, Bnyyz3, Bnyyz4, and Bnyyz5 horizons)

35—Hares gypsiferous loamy fine sand, 0 to 5 percent slopes

Map Unit Setting
Landform(s): Playa steps (fig. 42)
Elevation: 3,950 to 4,130 feet (1,205 to 1,260 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition
Hares and similar soils: 95 percent
Minor components: 5 percent
Astrobee and similar soils
Gypsic Aquisalids and similar soils
Gypsic Haplosalids and similar soils
Transformer and similar soils
Duneland

Description of the Hares Soil
Taxonomic classification: Hypergypsic, thermic Typic Torripsamments
Geomorphologic position: Playa steps
Parent material: Gypsiferous eolian sands
Slope: 0 to 5 percent

Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—20 percent

Chemical crust:
- salt—5 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—40 percent
- woody debris—25 percent
- bare soil—35 percent
- rock fragments—0 percent

Drainage class: Somewhat poorly drained

\( K_{sat} \) (solum): 1.98 to 99.92 inches per hour (14.00 to 705.00 micrometers per second)

Available water capacity (total inches): 4.6 (low)

Shrink-swell potential: About 0.8 LEP (low)

Flooding hazard: None

Depth to seasonal high water table (minimum): About 40 to 60 inches

Runoff class: Very low

Hydrologic group: A

Ecological site name: Gyp Playa Step (Deep)

Ecological site number: R042XB030NM

Present vegetation: Alkali sacaton, James’ seaheath, Torrey ephedra, and silverleaf scurfpea

Land capability classification (nonirrigated areas): 7c
Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 58 minutes 37.60 seconds N. and long. 106 degrees 14 minutes 17.70 seconds W.

Ayyz—0 to 2 inches (0 to 5 centimeters); pale brown (10YR 6/3) gypsiferous loamy fine sand, yellowish brown (10YR 5/4) moist; 4 percent clay; weak medium platy structure; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; finely disseminated salt and many fine irregular gypsum crystals throughout; noneffervescent, 51 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 20.0 dS/m (mmhos/cm); strongly saline; abrupt smooth boundary.

Cyyz1—2 to 5 inches (5 to 13 centimeters); very pale brown (10YR 7/3) gypsiferous loamy very fine sand, light yellowish brown (10YR 6/4) moist; 4 percent clay; massive; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; many very fine irregular and few fine tubular pores; finely disseminated salt and carbonate and many very fine irregular gypsum crystals throughout; very slightly effervescent, 2 percent calcium carbonate equivalent and 68 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 14.7 dS/m (mmhos/cm); moderately saline; abrupt smooth boundary.

Cyyz2—5 to 18 inches (13 to 46 centimeters); very pale brown (10YR 8.5/2) gypsiferous loamy fine sand, very pale brown (10YR 8/2) moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; common fine and medium roots throughout; many very fine irregular and few fine tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; very slightly effervescent, 2 percent calcium carbonate equivalent and 74 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 8.8 dS/m (mmhos/cm); moderately saline; gradual smooth boundary.

Cyyz3—18 to 32 inches (46 to 81 centimeters); very pale yellow (2.5Y 9.5/2) gypsiferous sand, very pale yellow (2.5Y 9/2) moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; few fine roots throughout; many very fine irregular pores; many medium irregular gypsum crystals throughout; noneffervescent, 78 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 9.2 dS/m (mmhos/cm); moderately saline; gradual smooth boundary.

Cyyz4—32 to 60 inches (81 to 152 centimeters); very pale yellow (2.5Y 9.5/2) gypsiferous sand, very pale yellow (2.5Y 9/2) moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; many medium irregular gypsum crystals throughout; noneffervescent, 78 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 8.9 dS/m (mmhos/cm); moderately saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 5 percent

Ayyz horizon:

Hue—7.5YR or 10YR
Value—6 to 8 dry; 5 to 7 moist
Chroma—1 to 4, dry or moist
Texture—gypsiferous sand, gypsiferous fine sand, gypsiferous loamy sand, or gypsiferous loamy fine sand
Clay content—1 to 5 percent
Reaction—moderately alkaline or strongly alkaline
Salinity—moderately saline or strongly saline
Gypsum content—50 to 90 percent
Cyyz horizons:
   Hue—7.5YR, 10YR, or 2.5YR
   Value—7 to 9.5 dry; 6 to 9 moist
   Chroma—2 to 4, dry or moist
   Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous loamy fine sand,
   or gypsiferous loamy very fine sand
   Clay content—0 to 5 percent
   Reaction—moderately alkaline or strongly alkaline
   Salinity—slightly saline to strongly saline
   Gypsum content—65 to 95 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 2 inches (Ayyz horizon)

36—Hathaway-Boracho complex, 15 to 50 percent slopes

Map Unit Setting
Landform(s): Fan piedmonts (fig. 43)
Elevation: 5,240 to 6,830 feet (1,597 to 2,082 meters)
Mean annual precipitation: 14 to 18 inches (356 to 457 millimeters)
Mean annual air temperature: 57 to 61 degrees F (14.0 to 16.0 degrees C)
Mean annual soil temperature: 59 to 63 degrees F (15.1 to 17.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-5 Chihuahuan Desert Hills and Bajadas

Map Unit Composition
Hathaway and similar soils: 50 percent
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Boracho and similar soils: 35 percent
Minor components: 15 percent
  Aladdin and similar soils
  Ardic Argiustolls and similar soils
  Woodcutter and similar soils
  Riverwash
  Rock outcrop

Description of the Hathaway Soil

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

Geomorphic position: Fan remnants
Parent material: Mixed gravelly alluvium
Slope: 15 to 50 percent

Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—65 percent
    woody debris—10 percent
    bare soil—5 percent
    rock fragments—65 percent gravel and 15 percent cobbles

Drainage class: Well drained

\[ K_{\text{sat}} \text{(solum): 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)} \]

Available water capacity (total inches): 4.7 (low)

Shrink-swell potential: About 1.7 LEP (low)

Flooding hazard: None
Runoff class: Medium
Hydrologic group: C

Ecological site name: Gravelly

Ecological site number: R042XD007NM

Present vegetation: Blue grama, honey mesquite, and New Mexico feathergrass

Land capability classification (nonirrigated areas): 6c

Typical Pedon (fig. 44)

Location by Geographic Coordinate System: lat. 33 degrees 43 minutes 48.60 seconds N. and long. 106 degrees 23 minutes 11.40 seconds W.

A—0 to 8.5 inches (0 to 22 centimeters); dark brown (7.5YR 3/3) very gravelly sandy loam, very dark brown (7.5YR 2.5/2) moist; 16 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and medium roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 40 percent gravel and 5 percent cobbles; strongly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk1—8.5 to 27.5 inches (22 to 70 centimeters); brown (7.5YR 5/3) very gravelly sandy clay loam, brown (7.5YR 4/3) moist; 22 percent clay; weak medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; few very fine and coarse roots throughout; few fine dendritic tubular pores; common medium
irregular carbonate masses throughout; 30 percent gravel and 6 percent cobbles; violently effervescent, 17 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Bk2—27.5 to 60 inches (70 to 152 centimeters); brown (7.5YR 5/4) very gravelly sandy clay loam, brown (7.5YR 4/4) moist; 24 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; common medium irregular carbonate masses and common coarse irregular carbonate nodules throughout; 40 percent gravel, 5 percent cobbles, and 5 percent stones; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 5 to 35 percent
Rock fragment content in control section: 35 to 75 percent

A horizon:
Hue—7.5YR
Value—2 to 4 dry; 1 to 3 moist
Chroma—2 to 3, dry or moist
Texture—sandy loam, loam, or sandy clay loam
Clay content—10 to 27 percent
Rock fragment content—15 to 60 percent
Reaction—slightly alkaline or moderately alkaline

Bk horizons:
Hue—7.5YR or 10YR
Value—3 to 7 dry; 2 to 6 moist
Chroma—2 to 4, dry or moist
Texture—loamy sand, sandy loam, loam, or sandy clay loam
Clay content—5 to 35 percent
Rock fragment content—35 to 75 percent
Calcium carbonate equivalent—15 to 35 percent
Reaction—slightly alkaline or moderately alkaline

**Diagnostic Features**
- Mollic epipedon—the zone from 0 to 8.5 inches (A horizon)
- Calcic horizon—the zone from 8.5 to 60 inches (Bk1 and Bk2 horizons)

**Description of the Boracho Soil**

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

*Geomorphic position:* Fan remnants

*Parent material:* Mixed gravelly alluvium

*Slope:* 15 to 50 percent

*Surface cover*

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—70 percent
  - woody debris—5 percent
  - bare soil—10 percent
  - rock fragments—60 percent gravel and 10 percent cobbles

*Depth to restrictive feature(s):* 16 to 20 inches to petrocalcic horizon

*Drainage class:* Moderately well drained

*K*<sub>s</sub><sup>at</sup> (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

*K*<sub>s</sub><sup>at</sup> (restrictive layer): 0.00 inches per hour (0.00 to 0.02 micrometer per second)

*Available water capacity (total inches):* 1.4 (very low)

*Shrink-swell potential:* About 1.8 LEP (low)

*Flooding hazard:* None

*Runoff class:* Very high

*Hydrologic group:* D

*Ecological site name:* Gravelly

*Ecological site number:* R042XD007NM

*Present vegetation:* Banana yucca, blue grama, New Mexico feathergrass, and oneseed juniper

*Land capability classification (nonirrigated areas):* 6c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 33 degrees 43 minutes 47.70 seconds N. and long. 106 degrees 23 minutes 12.10 seconds W.

A—0 to 8 inches (0 to 20 centimeters); brown (7.5YR 4/3) very gravelly coarse sandy loam, dark brown (7.5YR 3/3) moist; 14 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and
common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 40 percent gravel; strongly effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Bk—8 to 17 inches (20 to 43 centimeters); brown (7.5YR 5/3) very gravelly sandy clay loam, brown (7.5YR 4/3) moist; 22 percent clay; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots throughout; few very fine dendritic tubular pores; common medium irregular carbonate masses throughout; 35 percent gravel; violently effervescent, 16 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.

2Bkkm—17 to 25 inches (43 to 63 centimeters); pinkish white (7.5YR 8/2) cemented material, pink (7.5YR 7/3) moist; massive; violently effervescent, 27 percent calcium carbonate equivalent; clear wavy boundary.

2B’k—25 to 60 inches (63 to 152 centimeters); pink (7.5YR 7/3) very cobbly sandy clay loam, light brown (7.5YR 6/4) moist; 20 percent clay; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine irregular carbonate masses throughout; 30 percent gravel, 10 percent cobbles, and 15 percent stones; violently effervescent, 22 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 16 to 35 percent  
*Rock fragment content in control section: *35 to 75 percent

**A horizon:**
  
  Hue—7.5YR  
  Value—2 to 4 dry; 1 to 3 moist  
  Chroma—2 to 4, dry or moist  
  Texture—coarse sandy loam, sandy loam, loam, or sandy clay loam  
  Clay content—8 to 27 percent  
  Rock fragment content—20 to 45 percent  
  Reaction—slightly alkaline or moderately alkaline

**Bk horizon:**
  
  Hue—7.5YR or 10YR  
  Value—3 to 7 dry; 2 to 6 moist  
  Chroma—2 to 4, dry or moist  
  Texture—sandy loam, loam, or sandy clay loam  
  Clay content—16 to 35 percent  
  Rock fragment content—35 to 75 percent  
  Calcium carbonate equivalent—15 to 40 percent  
  Reaction—slightly alkaline or moderately alkaline

**2Bkkm horizon:**
  
  Cemented material—calcium carbonate  
  Hardness—extremely hard or indurated  
  Thickness—4 to 15 inches; laterally discontinuous

**Diagnostic Features**

- Mollic epipedon—the zone from 0 to 8 inches (A horizon)  
- Calcic horizon—the zone from 8 to 17 inches (Bk horizon)  
- Petrocalcic horizon—the zone from 17 to 25 inches (2Bkkm horizon)
37—Hembrillo-Shot association, 0 to 15 percent slopes

Map Unit Setting

Landform(s): Dunes and interdunes (fig. 45)
Elevation: 3,900 to 4,120 feet (1,190 to 1,255 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Hembrillo and similar soils: 50 percent
Shot and similar soils: 45 percent
Minor components: 5 percent
  Aerobee and similar soils
  Astrobee and similar soils
  Yesum and similar soils

Description of the Hembrillo Soil

Taxonomic classification: Gypsic, thermic Typic Torripsamments
Geomorphic position: All positions of dunes
Parent material: Gypsiferous eolian sands
Slope: 1 to 15 percent
Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—5 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—20 percent
- woody debris—15 percent
- bare soil—65 percent
- rock fragments—0 percent

Drainage class: Excessively drained

$K_{sod}$ (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

Available water capacity (total inches): 5.5 (moderate)

Shrink-swell potential: About 0.8 LEP (low)

Flooding hazard: None

Runoff class: Very low

Hydrologic group: A

Ecological site name: Deep Sand

Ecological site number: R042X011NM

Present vegetation: Dropseed, soaptree yucca, fourwing saltbush, giant dropseed, mesa dropseed, alkali sacaton, and Torrey ephedra

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 3 minutes 58.06 seconds N. and long. 106 degrees 20 minutes 44.93 seconds W.

Cy1—0 to 4 inches (0 to 10 centimeters); light brown (7.5YR 6/3) gypsiferous sand, brown (7.5YR 5/3) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine and medium roots throughout; common medium interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 30 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.9 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Cy2—4 to 21.5 inches (10 to 55 centimeters); light brown (7.5YR 6/3) gypsiferous sand, brown (7.5YR 5/3) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; common medium interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 31 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 3.2 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Cy3—21.5 to 35.5 inches (55 to 90 centimeters); light brown (7.5YR 6/3) gypsiferous sand, brown (7.5YR 5/3) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine roots throughout; common medium interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 31 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Cy4—35.5 to 51 inches (90 to 130 centimeters); light brown (7.5YR 6/3) gypsiferous sand, brown (7.5YR 5/3) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; common medium interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 39 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.7 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.
Cy5—51 to 78.5 inches (130 to 200 centimeters); light brown (7.5YR 6/3) gypsiferous sand, brown (7.5YR 5/3) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; common medium interstitial pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 42 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.8 dS/m (mmhos/cm); very slightly saline.

**Range in Characteristics**

**Clay content of control section (weighted average):** 0 to 5 percent

*Cy* horizons:
- **Hue**—7.5YR or 10YR
- **Value**—5 to 7 dry; 4 to 6 moist
- **Chroma**—3 to 6, dry or moist
- **Texture**—gypsiferous sand or gypsiferous loamy sand
- **Clay content**—0 to 5 percent
- **Reaction**—slightly alkaline or moderately alkaline
- **Salinity**—very slightly saline or slightly saline
- **Gypsum content**—25 to 42 percent

**Description of the Shot Soil**

*Taxonomic classification:* Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids

*Geomorphic position:* Interdunes

*Parent material:* Gypsiferous sandy eolian deposits over lacustrine deposits

*Slope:* 0 to 5 percent

*Surface cover*
- **Biological crust:**
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—10 percent
- **Chemical crust:**
  - salt—0 percent
  - gypsum—0 percent
- **Physical cover:**
  - canopy plant cover—25 percent
  - woody debris—15 percent
  - bare soil—60 percent
  - rock fragments—0 percent

*Drainage class:* Excessively drained

*K*<sub>sat</sub> (*solum*): 0.57 inch to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

*Available water capacity (total inches):* 6.3 (moderate)

*Shrink-swell potential:* About 1.6 LEP (low)

*Flooding hazard:* None

*Runoff class:* Very low

*Hydrologic group:* A

*Ecological site name:* Gyp Upland

*Ecological site number:* R042XB006NM

*Present vegetation:* Mesa dropseed, sand dropseed, spike dropseed, soaptree yucca, Torrey ephedra, blazingstar, desert baileya, fourwing saltbush, gyp dropseed, and phacelia

*Land capability classification (nonirrigated areas):* 7c
Figure 46.—Profile of the Shot soil in map unit 37 (Hembrillo-Shot association, 0 to 15 percent slopes).

Typical Pedon (fig. 46)

Location by Geographic Coordinate System: lat. 33 degrees 3 minutes 53.26 seconds N. and long. 106 degrees 20 minutes 59.87 seconds W.

Ayy—0 to 1 inch (0 to 3 centimeters); pink (7.5YR 7/3) gypsiferous sandy loam, brown (7.5YR 5/3) moist; 13 percent clay; weak very thick platy structure; slightly hard,
very friable, nonsticky, nonplastic; few very fine and fine roots throughout; few fine tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 65 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

Byy1—1 to 7 inches (3 to 18 centimeters); pink (7.5YR 7/3) gypsiferous sandy loam, brown (7.5YR 5/3) moist; 11 percent clay; weak medium coarse and very coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few medium and common very fine and fine roots throughout; few fine and medium tubular pores; finely disseminated carbonate, common fine and medium irregular gypsum crystal clusters, and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 74 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Byy2—7 to 11.5 inches (18 to 29 centimeters); pink (7.5YR 8/3) gypsiferous loamy fine sand, light brown (7.5YR 6/4) moist; 6 percent clay; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots throughout; few medium and fine tubular pores; finely disseminated carbonate, common fine irregular gypsum crystal clusters, and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 74 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.9 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Byy3—11.5 to 27.5 inches (29 to 70 centimeters); pink (7.5YR 8/3) gypsiferous loamy fine sand, light brown (7.5YR 6/4) moist; 7 percent clay; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine roots throughout; few fine tubular pores; finely disseminated carbonate, common fine irregular gypsum crystal clusters, and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 73 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.7 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Cyy1—27.5 to 31.5 inches (70 to 80 centimeters); pink (7.5YR 8/4) gypsiferous loamy sand, light brown (7.5YR 6/4) moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; many fine irregular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 62 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 4.8 dS/m (mmhos/cm); slightly saline; gradual wavy boundary.

Cyy2—31.5 to 40 inches (80 to 102 centimeters); pinkish white (7.5YR 8/2) gypsiferous loamy sand, light brown (7.5YR 6/4) moist; 7 percent clay; massive; moderately hard, friable, nonsticky, nonplastic; many fine irregular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 55 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 19.7 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

2Cyyz—40 to 60 inches (102 to 152 centimeters); light brown (7.5YR 6/3) gypsiferous sandy clay loam, brown (7.5YR 4/3) moist; 27 percent clay; massive; moderately hard, firm, slightly sticky, slightly plastic; many fine irregular pores; finely disseminated carbonate, common fine threadlike gypsum crystals, and common fine and common very fine irregular gypsum crystal clusters throughout; strongly effervescent, 5 percent calcium carbonate equivalent and 55 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 19.7 dS/m (mmhos/cm); strongly saline.
Range in Characteristics

Clay content of control section (weighted average): 5 to 15 percent
Other characteristics: Some pedons do not have a 2Cyyz horizon

Ayy horizon:
Value—6 to 7 dry; 5 to 6 moist
Chroma—3 to 7, dry or moist
Texture—gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous fine sandy loam
Clay content—5 to 15 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline or slightly saline
Gypsum content—50 to 70 percent

Byy horizons:
Value—5 to 6 dry; 4 to 6 moist
Chroma—3 to 4, dry or moist
Texture—gypsiferous loamy sand, gypsiferous loamy fine sand, or gypsiferous sandy loam
Clay content—5 to 15 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline or slightly saline
Gypsum content—40 to 80 percent

Cyy horizons:
Value—7 to 8 dry; 5 to 7 moist
Chroma—2 to 4, dry or moist
Texture—gypsiferous sand or gypsiferous loamy sand
Clay content—2 to 7 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline or slightly saline
Gypsum content—40 to 80 percent

2Cyyz horizon:
Hue—5YR or 7.5YR
Value—4 to 7 dry; 4 to 6 moist
Chroma—2 to 4, dry or moist
Texture—gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous sandy clay loam
Clay content—5 to 35 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—slightly saline to strongly saline
Gypsum content—40 to 80 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 1 inch (Ayy horizon)
• Gypsic horizon—the zone from 1 to 27.5 inches (Byy1, Byy2 and Byy3 horizons)

38—Hermes loam, 0 to 4 percent slopes

Map Unit Setting

Landform(s): Relict lakebeds
Elevation: 3,930 to 4,050 feet (1,197 to 1,234 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Hermes and similar soils: 87 percent
Minor components: 13 percent
  Jato and similar soils
  Loki and similar soils
  Peligro and similar soils
  Yesum and similar soils

Description of the Hermes Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Typic Petrogypsids
Geomorphic position: Relict lakebeds
Parent material: Alluvium over gypsiferous lacustrine deposits
Slope: 0 to 4 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—20 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—45 percent
    woody debris—15 percent
    bare soil—30 percent
    rock fragments—0 percent
Depth to restrictive feature(s): 33 to 37 inches to petrogypsic horizon
Drainage class: Well drained
K \(_{sat}\) (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
K \(_{sat}\) (restrictive layer): 0.00 to 0.06 inch per hour (0.01 to 0.42 micrometer per second)
Available water capacity (total inches): 4.3 (low)
Shrink-swell potential: About 2.9 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: C
Ecological site name: Gyp Outcrop
Ecological site number: R042XB007NM
Present vegetation: Alkali sacaton, fourwing saltbush, threeawn, burrograss, Torrey ephedra, forbs, and annuals
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 38 minutes 4.80 seconds N. and long. 106 degrees 21 minutes 45.40 seconds W.
A—0 to 2 inches (0 to 5 centimeters); light brown (7.5YR 6/3) loam, brown (7.5YR 4/3) moist; 20 percent clay; moderate medium platy over moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common fine roots throughout; few fine dendritic tubular pores; finely

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disseminated carbonate throughout; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk—2 to 8 inches (5 to 20 centimeters); pinkish gray (7.5YR 6/2) loam, brown (7.5YR 4/2) moist; 25 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few medium and common fine roots throughout; common medium dendritic tubular pores; common fine irregular carbonate masses throughout; violently effervescent, 22 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Byy—8 to 35.5 inches (20 to 90 centimeters); light gray (7.5YR 7/1) gypsiferous sandy loam, pinkish gray (7.5YR 7/2) moist; 5 percent clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine and fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 74 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.9 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Byym—35.5 to 63 inches (90 to 160 centimeters); white (5Y 8/1) cemented material, gray (5Y 6/1) moist; massive; many fine irregular gypsum crystals throughout; noneffervescent, 85 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 6.2 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 3 to 8 percent

Other characteristics: Some pedons do not have a Bk horizon

A horizon:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy loam, fine sandy loam, loam, or silt loam
- Clay content—18 to 27 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline to slightly saline
- Calcium carbonate equivalent—15 to 30 percent

Bk horizon:
- Hue—7.5YR or 10YR
- Value—6 to 8 dry; 4 to 7 moist
- Chroma—1 to 6, dry or moist
- Texture—sandy loam, loam, or silt loam
- Clay content—18 to 27 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline to slightly saline
- Calcium carbonate equivalent—15 to 30 percent

Byy horizon:
- Hue—7.5YR or 10YR
- Value—6 to 8 dry; 4 to 7 moist
- Chroma—1 to 6, dry or moist
- Texture—gypsiferous loamy sand, gypsiferous coarse sandy loam, gypsiferous sandy loam, or gypsiferous fine sandy loam
- Clay content—3 to 8 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline to slightly saline
Gypsum content—60 to 90 percent
Sodium adsorption ratio—less than 13

**Byym horizon:**
- Indurated material—gypsum
- Hardness—extremely hard or indurated
- Thickness—30 to 40 inches

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (A and Bk horizons)
- Gypsic horizon—the zone from 8 to 35 inches (Byy horizon)
- Petrogypsic horizon—the zone from 35 to 63 inches (Byym horizon)

**39—Ildecarb very gravelly loam, 0 to 25 percent slopes**

**Map Unit Setting**
- **Landform(s):** Fan piedmonts (fig. 47)
- **Elevation:** 4,910 to 7,030 feet (1,497 to 2,143 meters)
- **Mean annual precipitation:** 12 to 14 inches (305 to 356 millimeters)
- **Mean annual air temperature:** 50 to 54 degrees F (10.0 to 12.0 degrees C)
- **Mean annual soil temperature:** 52 to 56 degrees F (11.1 to 13.1 degrees C)
- **Frost-free period:** 120 to 180 days
- **Major Land Resource Area:** 70C—Central New Mexico Highlands
- **Land Resource Unit:** 70C.1 Central New Mexico Highlands

**Map Unit Composition**
- Ildecarb and similar soils: 85 percent
Minor components: 15 percent
Deama and similar soils
La Fonda and similar soils
Petrocalcids and similar soils
Penagua and similar soils
Tanbark and similar soils
Tulargo and similar soils
Winona and similar soils
Riverwash
Rock outcrop

Description of the Ildecarb Soil

**Taxonomic classification:** Loamy-skeletal, carbonatic, mesic Ustic Haplocalcids

**Geomorphic position:** Areas below limestone bedrock hills

**Parent material:** Gravelly alluvium derived from limestone

**Slope:** 0 to 25 percent

**Surface cover**

 Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

 Chemical crust:
- salt—0 percent
- gypsum—0 percent

 Physical cover:
- canopy plant cover—32 percent
- woody debris—5 percent
- bare soil—30 percent
- rock fragments—26 percent gravel, 12 percent cobbles, and 3 percent stones

 **Drainage class:** Well drained

 \( K_{sat} \) (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

 **Available water capacity (total inches):** 5.4 (moderate)

 **Shrink-swell potential:** About 1.7 LEP (low)

 **Flooding hazard:** None

 **Runoff class:** Low

 **Hydrologic group:** A

 **Ecological site name:** Gravelly

 **Ecological site number:** R070CY119NM

 **Present vegetation:** Black grama, New Mexico feathergrass, blue grama, hairy grama, other shrubs, sideoats grama, common wolfstail, plains lovegrass, threeawn, and winterfat

 **Land capability classification (nonirrigated areas):** 6c

 **Typical Pedon** (fig. 48)

 **Location by Geographic Coordinate System:** lat. 33 degrees 11 minutes 37.70 seconds N. and long. 106 degrees 42 minutes 24.20 seconds W.

 A—0 to 8 inches (0 to 20 centimeters); dark brown (7.5YR 3/3) very gravelly loam, dark brown (7.5YR 3/2) moist; 22 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 37 percent gravel and 5 percent cobbles; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline; clear smooth boundary.
Bk—8 to 29 inches (20 to 74 centimeters); pinkish gray (7.5YR 6/2) very gravelly loam, brown (7.5YR 5/2) moist; 24 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium roots throughout; few fine dendritic tubular pores; common distinct carbonate coats on rock fragments; finely disseminated carbonate throughout; 39 percent gravel and 3 percent cobbles; violently effervescent, 45 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; diffuse smooth boundary.

Bkk—29 to 60 inches (74 to 152 centimeters); pinkish gray (7.5YR 7/2) very gravelly loam, pinkish gray (7.5YR 6/2) moist; 24 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium roots throughout; few fine dendritic tubular pores; common distinct carbonate coats on rock fragments; finely disseminated carbonate throughout; 44 percent gravel and 5 percent cobbles; violently effervescent, 40 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 22 to 28 percent
Rock fragment content in control section: 35 to 50 percent
Other characteristics: Some pedons have a Bw horizon; some pedons have a By horizon below the series control section
A horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—3 to 6 dry; 2 to 5 moist
- Chroma—2 to 3, dry or moist
- Texture—loam or clay loam
- Clay content—20 to 30 percent
- Rock fragment content—35 to 60 percent
- Calcium carbonate equivalent—10 to 25 percent

Bk and Bkk horizons:
- Hue—5YR, 7.5YR, or 10YR
- Value—6 to 8 dry; 5 to 7 moist
- Chroma—1 to 4, dry or moist
- Texture—loam, sandy clay loam, or clay loam
- Clay content—22 to 35 percent
- Rock fragment content—36 to 70 percent
- Calcium carbonate equivalent—40 to 60 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A horizon)
- Calcic horizon—the zone from 8 to 60 inches (Bk and Bkk horizons)

40—Laborcita-Pilabo-Pantak complex, 5 to 45 percent slopes

Map Unit Setting

Landform(s): Escarpments and hills (fig. 49)
Elevation: 5,010 to 5,490 feet (1,526 to 1,673 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 61 to 64 degrees F (16.0 to 18.0 degrees C)
Mean annual soil temperature: 63 to 66 degrees F (17.1 to 19.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-3 Chihuahuan Desert Grassland

Map Unit Composition

Laborcita and similar soils: 35 percent
Pilabo and similar soils: 30 percent
Pantak and similar soils: 20 percent
Minor components: 15 percent
- Ustic Haplocalcids that are moderately deep to bedrock and similar soils
- Ustic Haplocambids with a fine-loamy particle-size class and similar soils
- Ustic Torriorthents with a sandy-skeletal particle-size class and similar soils
- Rock outcrop

Description of the Laborcita Soil

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Ustic Haplocalcids
Geomorphetic position: All positions of hills
Parent material: Gravelly alluvium derived from tuff
Slope: 5 to 45 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent

Chemical crust:
salt—0 percent
gypsum—0 percent

Physical cover:
canopy plant cover—15 percent
woody debris—0 percent
bare soil—40 percent
rock fragments—53 percent gravel and 2 percent cobbles

Drainage class: Well drained
$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Available water capacity (total inches): 6.9 (moderate)
Shrink-swell potential: About 2.1 LEP (low)
Flooding hazard: None
Runoff class: Medium
Hydrologic group: B
Ecological site name: Hills
Ecological site number: R042XB027NM
Present vegetation: Black grama, creosotebush, and soaptree yucca
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 49 minutes 13.80 seconds N. and long. 106 degrees 42 minutes 16.00 seconds W.

A—0 to 7.5 inches (0 to 19 centimeters); light yellowish brown (10YR 6/4) gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; 22 percent clay; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine roots throughout; few very fine irregular pores; finely
disseminated carbonate throughout; 25 percent gravel; violently effervescent, 12 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk1—7.5 to 40 inches (19 to 102 centimeters); light yellowish brown (10YR 6/4) gravelly loam, yellowish brown (10YR 5/4) moist; 20 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few very fine roots throughout; few very fine irregular pores; common fine irregular carbonate masses throughout; 20 percent gravel; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 1.6 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk2—40 to 60 inches (102 to 152 centimeters); very pale brown (10YR 7/3) sandy loam, pale brown (10YR 6/3) moist; 18 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few very fine roots throughout; common fine irregular carbonate masses throughout; 8 percent gravel; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 18 to 25 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam, loam, sandy clay loam, or clay loam

Bk horizons:
- Hue—7.5YR or 10YR
- Value—5 to 8 dry; 5 to 7 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam, loam, sandy clay loam, or clay loam

Diagnostic Features

- Ochric epipedon—the zone from 0 to 7 inches (A horizon)
- Calcic horizon—the zone from 7.5 to 40 inches (Bk1 and Bk2 horizons)

Description of the Pilabo Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Ustic Haplocambids

Geomorphic position: All positions of hills

Parent material: Colluvium over slope alluvium derived from tuff

Slope: 15 to 35 percent

Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—10 percent
- woody debris—0 percent
bare soil—15 percent
rock fragments—35 percent gravel, 35 percent cobbles, and 5 percent stones

Drainage class: Well drained

$K_{sat}$ (solum): 0.20 inch to 19.98 inches per hour (1.40 to 141.00 micrometers per second)

Available water capacity (total inches): 6.0 (moderate)
Shrink-swell potential: About 3.4 LEP (moderate)
Flooding hazard: None
Runoff class: High
Hydrologic group: C
Ecological site name: Hills
Ecological site number: R042XB027NM

Present vegetation: Black grama, other shrubs, bush muhly, sideoats grama, blue grama, green sprangletop, other annual forbs, and other half shrubs

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 49 minutes 23.80 seconds N. and long. 106 degrees 42 minutes 37.40 seconds W.

A—0 to 4 inches (0 to 10 centimeters); dark yellowish brown (10YR 4/4) gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; 14 percent clay; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots throughout; few very fine irregular pores; 16 percent gravel; noneffervescent; slightly alkaline, pH 7.8; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bw—4 to 13 inches (10 to 33 centimeters); dark yellowish brown (10YR 4/4) clay loam, dark yellowish brown (10YR 3/4) moist; 28 percent clay; weak fine subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; common very fine roots throughout; few very fine irregular pores; 10 percent gravel; noneffervescent; moderately alkaline, pH 8.0; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk—13 to 28 inches (33 to 71 centimeters); light yellowish brown (10YR 6/4) very gravelly loam, yellowish brown (10YR 5/4) moist; 20 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine irregular pores; common fine irregular carbonate masses throughout; 35 percent gravel and 5 percent cobbles; violently effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 1.9 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Ck1—28 to 40 inches (71 to 102 centimeters); light yellowish brown (10YR 6/4) very gravelly loam, yellowish brown (10YR 5/4) moist; 20 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; finely disseminated carbonate throughout; 40 percent gravel and 5 percent cobbles; violently effervescent, 14 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Ck2—40 to 60 inches (102 to 152 centimeters); light yellowish brown (10YR 6/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; 17 percent clay; massive; soft, very friable, nonsticky, nonplastic; finely disseminated carbonate throughout; 50 percent gravel; strongly effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 2.4 dS/m (mmhos/cm); very slightly saline.
Range in Characteristics

Clay content of control section (weighted average): 20 to 28 percent
Rock fragment content in control section: 35 to 60 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 2 to 3 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam or loam

Bw and Bk horizons:
- Hue—7.5YR or 10YR
- Value—3 to 7 dry; 3 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—loam, sandy clay loam, or clay loam

C horizons:
- Hue—7.5YR or 10YR
- Value—4 to 7 dry; 4 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy loam or loam

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 4 to 13 inches (Bw horizon)

Description of the Pantak Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Lithic Ustic Haplargids

Geomorphic position: All positions of hills
Parent material: Gravelly colluvium derived from tuff
Slope: 15 to 45 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—20 percent
  - woody debris—0 percent
  - bare soil—15 percent
  - rock fragments—60 percent gravel, 10 percent cobbles, and 10 percent stones

Depth to restrictive feature(s): 7 to 20 inches to lithic bedrock
Drainage class: Well drained
K\text{sat} (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
K\text{sat} (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)
Available water capacity (total inches): 0.2 (very low)
Shrink-swell potential: About 1.9 LEP (low)
Flooding hazard: None
Runoff class: High
Hydrologic group: D
Ecological site name: Hills
Ecological site number: R042XB027NM
Present vegetation: Black grama, creosote bush, and soaptree yucca
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 49 minutes 10.30 seconds N. and long. 106 degrees 42 minutes 1.70 seconds W.

A—0 to 2 inch (0 to 5 centimeters); brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; 18 percent clay; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few fine roots throughout; few very fine irregular pores; 4 percent gravel and 2 percent cobbles; noneffervescent; slightly alkaline, pH 7.8; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Btk—2 to 7 inches (5 to 18 centimeters); dark yellowish brown (10YR 4/4) very cobbly sandy clay loam, brown (10YR 4/3) moist; 24 percent clay; weak very fine and fine subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; few fine and medium and common very fine roots throughout; few very fine irregular pores; few faint clay films on all faces of peds; finely disseminated carbonate and common fine irregular carbonate nodules throughout; 20 percent gravel and 16 percent cobbles; violently effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; abrupt irregular boundary.

R—7 inches (18 centimeters); unweathered, unfractured, and indurated tuff.

Range in Characteristics

Clay content of control section (weighted average): 18 to 30 percent
Rock fragment content in control section: 35 to 55 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—2 to 4, dry or moist
- Texture—fine sandy loam or sandy loam

Btk horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy clay loam, loam, or clay loam

Diagnostic Features
• Ochric epipedon—the zone from 0 to 2 inch (A horizon)
• Argillic horizon—the zone from 2 to 7 inches (Btk horizon)
• Depth to lithic contact—7 inches (R horizon)

41—Lark association, 0 to 60 percent slopes, duneland

Map Unit Setting

Landform(s): Dunes (fig. 50)
Elevation: 3,970 to 4,130 feet (1,210 to 1,260 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Lark, barren and similar soils: 45 percent
Lark and similar soils: 40 percent
Minor components: 15 percent
  Transformer and similar soils
  Astrobbee and similar soils

Description of the Lark, Barren Soil

Taxonomic classification: Hypergypsic, thermic Typic Torripsamments
Geomorphic position: All positions of parabolic dunes in nonvegetated areas
Parent material: Gypsiferous eolian sands
Slope: 5 to 60 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—0 percent

Figure 50.—An area of map unit 41 (Lark association, 0 to 60 percent slopes, duneland).
woody debris—0 percent  
bare soil—100 percent  
rock fragments—0 percent

**Drainage class:** Excessively drained  
**$K_{sat}$ (solum):** 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)  
**Available water capacity (total inches):** 4.4 (low)  
**Shrink-swell potential:** About 0.2 LEP (low)  
**Flooding hazard:** None  
**Runoff class:** Low  
**Hydrologic group:** A  
**Ecological site name:** Gyp Duneland Barren  
**Ecological site number:** R042X002NM  
**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 32 degrees 47 minutes 19.70 seconds N. and long. 106 degrees 12 minutes 20.20 seconds W.

**Cyy—0 to 63 inches (0 to 160 centimeters);** white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; single grain; loose, loose, nonsticky, nonplastic; common medium interstitial pores; many medium irregular gypsum crystals throughout; noneffervescent, 96 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.6 dS/m (mmhos/cm); very slightly saline.

**Range in Characteristics**

*Note: This component consists of unstabilized mounds, ridges, banks, or hills of loose eolian materials (typically sands) that are usually devoid of vegetation and capable of movement from place to place.*

**Clay content of control section (weighted average):** 0 to 5 percent

**Cyy horizon:**

- **Hue**—10YR or 2.5Y  
- **Value**—8 to 9.5 dry; 8 to 9 moist  
- **Chroma**—1 to 2, dry or moist  
- **Reaction**—slightly alkaline or moderately alkaline  
- **Gypsum content**—90 to 100 percent

**Description of the Lark Soil**

**Taxonomic classification:** Hypergypsic, thermic Typic Torripsamments  
**Geomorphic position:** All positions on parabolic dunes in vegetated areas  
**Parent material:** Gypsiferous eolian sands  
**Slope:** 0 to 35 percent  
**Surface cover**

- **Biological crust:**  
  - cyanobacteria—0 percent  
  - lichen—0 percent  
  - moss—0 percent  
  - cryptogamic crust—0 percent  
- **Chemical crust:**  
  - salt—0 percent  
  - gypsum—0 percent  
- **Physical cover:**  
  - canopy plant cover—10 percent
woody debris—5 percent
bare soil—95 percent
rock fragments—0 percent

**Drainage class:** Excessively drained

\( K_{sat} \) (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)

**Available water capacity (total inches):** 4.2 (low)

**Shrink-swell potential:** About 0.2 LEP (low)

**Flooding hazard:** None

**Runoff class:** Negligible

**Hydrologic group:** A

**Ecological site name:** Vegetated Gypsum Dunes

**Ecological site number:** R042XB003NM

**Present vegetation:** Soaptree yucca, gypsum grama, rosemary mint, sandhill muhly, and Torrey's jointfir

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 32 degrees 53 minutes 33.80 seconds N. and long. 106 degrees 10 minutes 42.10 seconds W.

Cyy1—0 to 30 inches (0 to 76 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; common medium interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 94 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; diffuse smooth boundary.

Cyy2—30 to 60 inches (76 to 152 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; single grain; loose, loose, nonsticky, nonplastic; few very fine roots throughout; common medium interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 96 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 4.2 dS/m (mmhos/cm); slightly saline.

**Range in Characteristics**

**Clay content of control section (weighted average):** 0 to 5 percent

**Cyy horizons:**

- **Hue:** 10YR or 2.5Y
- **Value:** 8 to 9.5 dry; 8 to 9 moist
- **Chroma:** 1 to 2, dry or moist
- **Reaction:** Slightly alkaline or moderately alkaline
- **Gypsum content:** 90 to 100 percent

**42—Lark association, 5 to 90 percent slopes, duneland**

**Map Unit Setting**

**Landform(s):** Dunes (fig. 51)

**Elevation:** 3,940 to 4,080 feet (1,200 to 1,245 meters)

**Mean annual precipitation:** 8 to 12 inches (203 to 305 millimeters)

**Mean annual air temperature:** 64 to 70 degrees F (18.0 to 21.0 degrees C)

**Mean annual soil temperature:** 66 to 72 degrees F (19.1 to 22.1 degrees C)

**Frost-free period:** 180 to 240 days

**Major Land Resource Area:** 42—Southern Desertic Basins, Plains, and Mountains

**Land Resource Unit:** 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Lark, windward and similar soils: 75 percent
Lark, leeward and similar soils: 20 percent
Minor components: 5 percent
  Transformer and similar soils
  Lark and similar soils
  Astrobee and similar soils

Description of the Lark, Windward Soil

*Taxonomic classification:* Hypergypsic, thermic Typic Torripsamments
*Geomorphic position:* Windward side of transverse and barchan dunes
*Parent material:* Gypsiferous eolian sands
*Slope:* 5 to 30 percent
*Surface cover*
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
*Physical cover:*
  canopy plant cover—0 percent
  woody debris—0 percent
  bare soil—100 percent
  rock fragments—0 percent
*Drainage class:* Excessively drained
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

\( K_{\text{sat}} \) (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)

Available water capacity (total inches): 4.2 (low)

Shrink-swell potential: About 0.2 LEP (low)

Flooding hazard: None

Runoff class: Negligible

Hydrologic group: A

Ecological site name: Gyp Duneland Barren

Ecological site number: R042XB002NM

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 11.00 seconds N. and long. 106 degrees 16 minutes 43.00 seconds W.

Cyy—0 to 60 inches (0 to 152 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; single grain; loose, loose, nonsticky, nonplastic; many very fine interstitial pores; many medium irregular gypsum crystals throughout; noneffervescent, 96 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 3.3 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Note: This component consists of unstabilized mounds, ridges, banks, or hills of loose eolian materials (typically sands) that are usually devoid of vegetation and capable of movement from place to place.

Clay content of control section (weighted average): 0 to 5 percent

Cyy horizon:

Hue—10YR or 2.5Y
Value—8 to 9.5 dry; 7 to 9 moist
Chroma—1 to 2, dry or moist
Texture—gypsiferous sand or gypsiferous fine sand
Gypsum content—90 to 100 percent
Reaction—slightly alkaline or moderately alkaline

Description of the Lark, Leeward Soil

Taxonomic classification: Hypergypsic, thermic Typic Torripsamments

Geomorphic position: Leeward side of transverse and barchan dunes

Parent material: Gypsiferous eolian sands

Slope: 25 to 90 percent

Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—0 percent
- woody debris—0 percent
- bare soil—100 percent
- rock fragments—0 percent
Drainage class: Excessively drained

$K_{sat}$ (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)

Available water capacity (total inches): 4.4 (low)

Shrink-swell potential: About 0.2 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: A

Ecological site name: Gyp Duneland Barren

Ecological site number: R042XB002NM

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 49 minutes 32.90 seconds N. and long. 106 degrees 16 minutes 59.20 seconds W.

Cyy1—0 to 28.5 inches (0 to 73 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; single grain; loose, loose, nonsticky, nonplastic; many very fine interstitial pores; many medium irregular gypsum crystals throughout; noneffervescent, 96 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 2.7 dS/m (mmhos/cm); very slightly saline; diffuse wavy boundary.

Cyy2—28.5 to 63 inches (73 to 160 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; single grain; loose, loose, nonsticky, nonplastic; many very fine interstitial pores; many medium irregular gypsum crystals throughout; noneffervescent, 98 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Note: This component consists of unstabilized mounds, ridges, banks, or hills of loose eolian materials (typically sands) that are usually devoid of vegetation and capable of movement from place to place.

Clay content of control section (weighted average): 0 to 5 percent

Cyy horizons:

Hue—10YR or 2.5Y
Value—8 to 9.5 dry; 7 to 9 moist
Chroma—1 to 2, dry or moist
Texture—gypsiferous sand or gypsiferous fine sand
Gypsum content—90 to 100 percent
Reaction—slightly alkaline or moderately alkaline

43—Lark-Transformer association, 0 to 40 percent slopes

Map Unit Setting

Landform(s): Dunes and interdunes (fig. 52)
Elevation: 3,890 to 4,050 feet (1,186 to 1,235 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Lark and similar soils: 50 percent
Transformer and similar soils: 40 percent
Minor components: 10 percent
  Astrobee and similar soils
  Peligro and similar soils
  Typic Petrocalcids and similar soils
  Typic Torriorthents and similar soils
  Duneland

Description of the Lark Soil

*Taxonomic classification:* Hypergypsic, thermic Typic Torripsamments
*Geomorphic position:* Vegetated parabolic dunes
*Parent material:* Gypsiferous eolian sands
*Slope:* 1 to 40 percent
*Surface cover*
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
*Physical cover:*
  canopy plant cover—25 percent
  woody debris—5 percent
  bare soil—80 percent
  rock fragments—0 percent
Drainage class: Excessively drained

$K_{sat}$ (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

Available water capacity (total inches): 3.0 (low)

Shrink-swell potential: About 0.5 LEP (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Medium

Hydrologic group: A

Ecological site name: Vegetated Gypsum Dunes

Ecological site number: R042XB003NM

Present vegetation: Alkali sacaton, broom dalea, gyp dropseed, gypsum grama, sand sagebrush, soaptree yucca, Torrey ephedra, and western yarrow

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 47 minutes 23.60 seconds N. and long. 106 degrees 12 minutes 28.40 seconds W.

Cyy1—0 to 2.5 inches (0 to 6 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; many fine interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent and 84 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.6 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Cyy2—2.5 to 40.5 inches (6 to 103 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; many fine interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent and 83 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.0 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Cyy3—40.5 to 60 inches (103 to 152 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent and 83 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 3.9 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 5 percent

Cyy horizons:
- Hue—10YR or 2.5Y
- Value—7 to 9.5 dry; 6 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand, gypsiferous fine sand, gypsiferous loamy sand, or gypsiferous loamy fine sand
- Clay content—0 to 5 percent
- Gypsum content—70 to 90 percent
- Reaction—slightly alkaline or moderately alkaline

Description of the Transformer Soil

Taxonomic classification: Hypergypsic, thermic Oxyaquic Torripsamments

Geomorphic position: Interdunes

Parent material: Gypsiferous eolian sands
Slope: 0 to 3 percent

Surface cover

Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent

Chemical crust:
salt—0 percent
gypsum—0 percent

Physical cover:
canopy plant cover—25 percent
woody debris—5 percent
bare soil—75 percent
rock fragments—0 percent

Drainage class: Somewhat poorly drained

\( K_{sat} \) (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

Available water capacity (total inches): 3.0 (low)

Shrink-swell potential: About 0.5 LEP (low)

Flooding hazard: None

Ponding hazard: Rare

Depth to seasonal high water table (minimum): About 10 to 39 inches

Runoff class: Negligible

Hydrologic group: A

Ecological site name: Gyp Interdune (Wet)

Ecological site number: R042XB004NM

Present vegetation: Alkali sacaton, gyp dropseed, gyp grama, hairy coldenia, Torrey ephedra, and western yarrow

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 47 minutes 17.10 seconds N. and long. 106 degrees 12 minutes 16.50 seconds W.

Cyyz1—0 to 2.5 inches (0 to 6 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; many fine interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 14.4 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Cyyz2—2.5 to 28 inches (6 to 71 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; many fine interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 12.3 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Cyyz3—28 to 60 inches (71 to 152 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 13.2 dS/m (mmhos/cm); moderately saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 5 percent
Cyyz horizons:
- Hue—10YR or 2.5Y
- Value—7 to 9.5 dry; 6 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand, gypsiferous fine sand, gypsiferous loamy sand, or gypsiferous loamy fine sand
- Clay content—0 to 5 percent
- Gypsum content—70 to 90 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
- Endosaturation—the zone from 27.5 to 60 inches

44—Lark-Transformer association, 0 to 90 percent slopes, duneland

Map Unit Setting

Landform(s): Dunes and interdunes (fig. 53)
Elevation: 3,900 to 4,040 feet (119 to 1,230 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Lark, leeward and similar soils: 35 percent
Lark, windward and similar soils: 35 percent
Transformer and similar soils: 20 percent
Minor components: 10 percent
    Astrobee and similar soils

Description of the Lark, Leeward Soil

Taxonomic classification: Hypergypsic, thermic Typic Torripsamments
Geomorphic position: The steeply sloping leeward side of dense transverse and
    barchan dunes
Parent material: Gypsiferous eolian sands
Slope: 45 to 90 percent
Surface cover
    Biological crust:
        cyanobacteria—0 percent
        lichen—0 percent
        moss—0 percent
        cryptogamic crust—0 percent
    Chemical crust:
        salt—0 percent
        gypsum—0 percent
    Physical cover:
        canopy plant cover—0 percent
        woody debris—0 percent
        bare soil—100 percent
        rock fragments—0 percent
Drainage class: Excessively drained
    $K_{sat}$ (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per
        second)
Available water capacity (total inches): 5.0 (low)
Shrink-swell potential: About 0.5 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: A
Ecological site name: Gyp Duneland Barren
Ecological site number: R042XB002NM
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 37.00
    seconds N. and long. 106 degrees 15 minutes 50.20 seconds W.

Cyy—0 to 71 inches (0 to 180 centimeters); white (2.5Y 9.5/1) gypsiferous sand; white
    (2.5Y 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic;
    many fine interstitial pores; many fine irregular gypsum crystals throughout;
    noneffervescent, 95 percent gypsum; slightly alkaline, pH 7.6; electrical
    conductivity of 3.5 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

    Note: This component consists of unstabilized mounds, ridges, banks, or hills of
    loose eolian materials (typically sands) that are usually devoid of vegetation and
    capable of movement from place to place.

Clay content of control section (weighted average): 0 to 5 percent
Cyy horizon:
Hue—10YR or 2.5Y
Value—8 to 9.5 dry; 7 to 9 moist
Chroma—1 to 3, dry or moist
Texture—gypsiferous sand or gypsiferous fine sand
Gypsum content—90 to 100 percent

Description of the Lark, Windward Soil

Taxonomic classification: Hypergypsic, thermic Typic Torripsamments
Geomorphic position: The gently sloping windward side of dense transverse and barchan dunes
Parent material: Gypsiferous eolian sands
Slope: 3 to 30 percent
Surface cover
Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent
Chemical crust:
- salt—0 percent
- gypsum—0 percent
Physical cover:
- canopy plant cover—0 percent
- woody debris—0 percent
- bare soil—100 percent
- rock fragments—0 percent
Drainage class: Excessively drained

\[ K_{sat} \text{ (solum)}: 19.98 \text{ to } 99.92 \text{ inches per hour (141.00 to 705.00 micrometers per second)} \]

Available water capacity (total inches): 4.2 (low)

Shrink-swell potential: About 0.5 LEP (low)
Flooding hazard: None
Runoff class: Very low
Hydrologic group: A
Ecological site name: Gyp Duneland Barren
Ecological site number: R042XB002NM
Land capability classification (nonirrigated areas): 7c

Typical Pedon
Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 40.40 seconds N. and long. 106 degrees 15 minutes 50.00 seconds W.

Cyy1—0 to 8 inches (0 to 20 centimeters); white (2.5Y 9.5/1) gypsiferous sand, white (2.5Y 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 95 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 3.2 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Cyy2—8 to 25.5 inches (20 to 65 centimeters); white (2.5Y 9.5/1) gypsiferous sand, white (2.5Y 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 97 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 4.3 dS/m (mmhos/cm); slightly saline; clear wavy boundary.
Cyy3—25.5 to 60 inches (65 to 152 centimeters); white (2.5Y 9.5/1) gypsiferous sand, white (2.5Y 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 94 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 3.9 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Note: This component consists of unstabilized mounds, ridges, banks, or hills of loose eolian materials (typically sands) that are usually devoid of vegetation and capable of movement from place to place.

Clay content of control section (weighted average): 0 to 5 percent

Cyy horizons:
- Hue—10YR or 2.5Y
- Value—8 to 9.5 dry; 7 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand or gypsiferous fine sand
- Salinity—very slightly saline or slightly saline
- Gypsum content—90 to 100 percent

Description of the Transformer Soil

Taxonomic classification: Hypergypsic, thermic Oxyaquic Torripsamments

Geomorphic position: Interdunes surrounded by dense transverse and barchan dunes

Parent material: Gypsiferous eolian sands

Slope: 0 to 3 percent

Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—3 percent
  - gypsum—0 percent

Physical cover:
- canopy plant cover—20 percent
- woody debris—5 percent
- bare soil—80 percent
- rock fragments—0 percent

Drainage class: Somewhat poorly drained

\( K_{sat} \) (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)

Available water capacity (total inches): 5.5 (moderate)

Shrink-swell potential: About 0.5 LEP (low)

Flooding hazard: None

Depth to seasonal high water table (minimum): About 0 to 31 inches

Runoff class: Negligible

Hydrologic group: A/D

Ecological site name: Gyp Interdune (Wet)

Ecological site number: R042XB004NM

Present vegetation: Alkali sacaton and soaptree yucca

Land capability classification (nonirrigated areas): 7c
Typical Pedon (fig. 54)

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 37.55 seconds N. and long. 106 degrees 15 minutes 49.94 seconds W.

Ayyz—0 to 2 inches (0 to 5 centimeters); white (2.5Y 9.5/1) gypsiferous sand, white (2.5Y 9/1) moist; 1 percent clay; weak thin platy and weak thick platy structure; slightly hard, friable, nonsticky, nonplastic; many fine and medium and few very fine roots throughout; many fine interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 97 percent gypsum; strongly alkaline, pH 8.5; electrical conductivity of 17.9 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

Cyyz1—2 to 15.5 inches (5 to 40 centimeters); white (2.5Y 9.5/1) gypsiferous sand, white (2.5Y 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; few very fine and medium roots throughout; many fine interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 98 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 18.2 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

Cyyz2—15.5 to 23.5 inches (40 to 60 centimeters); white (2.5Y 9.5/1) gypsiferous sand, white (2.5Y 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine and medium roots throughout; many fine interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 99 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 17.8 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.
Cyyz3—23.5 to 78.5 inches (60 to 200 centimeters); white (2.5Y 9.5/1) gypsiferous sand, white (2.5Y 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine roots throughout; many fine interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 97 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 18.1 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 5 percent

Ayyz horizon:
- Hue—10YR or 2.5Y
- Value—8 to 9.5 dry; 7 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand or gypsiferous fine sand
- Reaction—slightly alkaline to strongly alkaline
- Salinity—moderately saline or strongly saline
- Gypsum content—90 to 100 percent

Cyyz horizons:
- Hue—10YR or 2.5Y
- Value—8 to 9.5 dry; 7 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand or gypsiferous fine sand
- Reaction—slightly alkaline to strongly alkaline
- Salinity—moderately saline or strongly saline
- Gypsum content—90 to 100 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 2 inches (Ayyz horizon)
- Endosaturation—the zone from 25 to 60 inches

45—Lava flows-Lithic Haplocambids complex, 0 to 45 percent slopes

Map Unit Setting

Landform(s): Lava flows (fig. 55)
Elevation: 4,140 to 4,170 feet (1,261 to 1,270 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Lava flows: 78 percent
Lithic Haplocambids and similar soils: 15 percent
Minor components: 7 percent
- Gypsic Haplosalids and similar soils
- Hermes and similar soils
- Loki and similar soils
- Nasa and similar soils
- Yesum and similar soils
- Rock outcrop with slopes of 45 to 90 percent
Description of Lava Flows

This component consists of exposures of solidified rock formed from the surficial outpouring of molten lava. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Description of the Lithic Haplocambids

*Taxonomic classification:* Lithic Haplocambids  
*Geomorphic position:* Shallow depressions and cracks within lava flows  
*Parent material:* Eolian deposits  
*Slope:* 0 to 5 percent  
*Surface cover*  
- Biological crust:  
  - cyanobacteria—0 percent  
  - lichen—0 percent  
  - moss—0 percent  
  - cryptogamic crust—5 percent  
- Chemical crust:  
  - salt—0 percent  
  - gypsum—0 percent  
*Physical cover:*  
- canopy plant cover—35 percent  
- woody debris—10 percent  
- bare soil—10 percent  
- basalt bedrock—60 percent  
- rock fragments—10 percent gravel

Figure 55.—An area of map unit 45 (Lava flows-Lithic Haplocambids complex, 0 to 45 percent slopes). This map unit consists of smooth pahoehoe lava in nearly level areas and ‘a’a lava flows around collapsed lava tubes. Numerous kipukas are found within the Carrizozo lava flow.
Depth to restrictive feature(s): 12 to 18 inches to lithic bedrock

Drainage class: Well drained

$K_{sat}$ (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.01 to 0.42 micrometer per second)

Available water capacity (total inches): 2.2 (very low)

Shrink-swell potential: About 2.4 LEP (low)

Flood hazard: None

Runoff class: Medium

Hydrologic group: D

Ecological site name: Malpais

Ecological site number: R042XB037NM

Present vegetation: Sixweeks grama, sideoats grama, bush muhly, fourwing saltbush, alkali sacaton, threeawn, bush muhly, creosote bush, fluffgrass, honey mesquite, pricklypear, and wolfberry

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 18 minutes 8.29 seconds N. and long. 106 degrees 18 minutes 57.65 seconds W.

A—0 to 1 inch (0 to 3 centimeters); brown (7.5YR 4/4) loam, dark brown (7.5YR 3/4) moist; 20 percent clay; weak medium platy structure; soft, very friable, slightly sticky, slightly plastic; few fine roots throughout; finely disseminated carbonate throughout; 10 percent gravel; strongly effervescent, 9 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw1—1 to 7 inches (3 to 18 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 22 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent gravel; strongly effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bw2—7 to 13 inches (18 to 33 centimeters); brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; 20 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent gravel; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; very abrupt wavy boundary.

R—13 inches (33 centimeters); unweathered, unfractured, and indurated basalt.

Range in Characteristics

Note: Lithic Haplomudids have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 10 to 27 percent

Rock fragment content in control section: Average of less than 15 percent

A horizon:

- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—very fine sandy loam, loam, or silt loam
- Clay content—12 to 27 percent
- Reaction—slightly alkaline or moderately alkaline
Bw horizons:

- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—very fine sandy loam, loam, or silt loam
- Clay content—10 to 27 percent
- Reaction—slightly alkaline or moderately alkaline

**Diagnostic Features**

- Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
- Cambic horizon—the zone from 1 to 13 inches (Bw1 and Bw2 horizons)
- Depth to lithic contact—13 inches (R horizon)

**46—Llano-Ratscat complex, 0 to 7 percent slopes**

**Map Unit Setting**

- **Landform(s):** Basin floors (fig. 56)
- **Elevation:** 3,890 to 3,990 feet (1,187 to 1,216 meters)
- **Mean annual precipitation:** 8 to 12 inches (203 to 305 millimeters)
- **Mean annual air temperature:** 64 to 70 degrees F (18.0 to 21.0 degrees C)
- **Mean annual soil temperature:** 66 to 72 degrees F (19.1 to 22.1 degrees C)
- **Frost-free period:** 180 to 240 days
- **Major Land Resource Area:** 42—Southern Desertic Basins, Plains, and Mountains
- **Land Resource Unit:** 42-2 Chihuahuan Desert Shrub

Figure 56.—An area of map unit 46 (Llano-Ratscat complex, 0 to 7 percent slopes).
Map Unit Composition

Llano and similar soils: 60 percent
Ratscat and similar soils: 30 percent
Minor components: 10 percent
  Aquisalids
  Bigsalt and similar soils
  Nasa and similar soils
  Transformer and similar soils
  Duneland

Description of the Llano Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic, shallow Petrogypsic Haplosalids

Geomorphic position: Relict lakebeds

Parent material: Gypsiferous lacustrine deposits

Slope: 0 to 3 percent

Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—10 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—3 percent
    woody debris—1 percent
    bare soil—90 percent
    rock fragments—0 percent

Depth to restrictive feature(s): 0 to 2 inches to salic horizon; 12 to 14 inches to petrogypsic horizon

Drainage class: Somewhat poorly drained

$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

$K_{sat}$ (restrictive layer): 0.01 to 0.06 inch per hour (0.10 to 0.42 micrometer per second)

Available water capacity (total inches): 0.0 (very low)

Shrink-swell potential: About 1.0 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: D

Ecological site name: Alkali Flat

Ecological site number: R042XB001NM

Present vegetation: Iodinebush

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 57)

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 38.20 seconds N. and long. 106 degrees 24 minutes 7.70 seconds W.

Anyyyz—0 to 2 inches (0 to 5 centimeters); white (2.5Y 8/1) gypsiferous loamy sand, pale yellow (2.5Y 8/2) moist; 4 percent clay; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; many fine platy gypsum crystals throughout; noneffervescent, 78 percent gypsum; moderately alkaline, pH
Figure 57.—Profile of the Llano soil in map unit 46 (Llano-Ratscat complex, 0 to 7 percent slopes). Scale is in centimeters.

7.9; electrical conductivity of 37.6 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

Bnyyz—2 to 12.5 inches (5 to 32 centimeters); white (2.5Y 8/1) gypsiferous loamy fine sand, pale yellow (2.5Y 8/2) moist; 4 percent clay; moderate thick platy structure; hard, very firm, nonsticky, nonplastic; many very fine irregular gypsum crystals throughout; noneffervescent, 87 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 53.4 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

Bnyyzm1—12.5 to 35.5 inches (32 to 90 centimeters); pale yellow (2.5Y 8/2) cemented material, pale yellow (2.5Y 7/3) moist; massive; many very fine irregular gypsum crystals throughout; noneffervescent, 83 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 82.3 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

Bnyyzm2—35.5 to 52 inches (90 to 132 centimeters); white (10YR 8/1), light gray (10YR 7/1) moist; massive; few coarse tubular pores; 2 percent fine masses of oxidized iron on surfaces along pores; many very fine irregular gypsum crystals throughout; noneffervescent, 86 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 89.6 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

2Cnyyz—52 to 60 inches (132 to 152 centimeters); light gray (5Y 7/1) gypsiferous fine sandy loam, gray (5Y 6/1) moist; 8 percent clay; massive; slightly hard, very firm, nonsticky, nonplastic; many very fine irregular gypsum crystals throughout; noneffervescent, 89 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 113.9 dS/m (mmhos/cm); strongly saline.
Range in Characteristics

Clay content of control section (weighted average): 2 to 10 percent

Anyzz horizon:
Hue—gley 1, 10YR, 2.5Y, or 5Y
Value—1 to 9 dry; 2 to 8 moist
Chroma—neutral to 4, dry or moist
Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous loamy fine sand, or gypsiferous sandy loam
Clay content—0 to 10 percent
Gypsum content—60 to 90 percent
Salinity—moderately saline or strongly saline

Bnnyyz horizon:
Hue—gley 1, 10YR, 2.5Y, or 5Y
Value—1 to 9 dry; 2 to 8 moist
Chroma—neutral to 4, dry or moist
Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous loamy fine sand, gypsiferous sandy loam, gypsiferous silt loam, or gypsiferous loam
Clay content—2 to 10 percent
Gypsum content—60 to 90 percent
Reaction—slightly alkaline or moderately alkaline

Bnnyzym horizons:
Cemented material—gypsum
Hardness—very strongly cemented to indurated
Thickness—20 to 50 inches; laterally continuous

2Cnyzz horizon:
Hue—gley 1, 10YR, 2.5Y, or 5Y
Value—4 to 7 dry; 3 to 6 moist
Chroma—1 to 4, dry or moist
Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous loamy fine sand, gypsiferous sandy loam, gypsiferous fine sandy loam, gypsiferous silt loam, or gypsiferous loam
Clay content—6 to 15 percent
Gypsum content—60 to 90 percent
Reaction—slightly alkaline or moderately alkaline

Diagnostic Features

- Ochric epipedon—the zone from 0 to 2 inches (Anyzz horizon)
- Gypsic horizon—the zone from 2 to 12.5 inches (Bnnyyz horizon)
- Petrogypsic horizon—the zone from 12.5 to 52 inches (Bnnyzym1 and Bnnyzym2 horizons)
- Salic horizon—the zone from 0 to 60 inches (Anyzz, Bnnyyz, Bnnyzym1, Bnnyzym2, and 2Cnyzz horizons)
- Episaturation—the zone from 0 to 19.5 inches

Description of the Ratscat Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Typic Haplosalids
Geomorphic position: Relict lakebeds
Parent material: Gypsiferous lacustrine deposits
Slope: 0 to 7 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent

Chemical crust:
salt—10 percent
gypsum—0 percent

Physical cover:
canopy plant cover—0 percent
woody debris—0 percent
bare soil—90 percent
rock fragments—0 percent

Depth to restrictive feature(s): 0 to 6 inches to salic horizon

Drainage class: Moderately well drained

$K_{sat}$ (solum): 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity (total inches): 0.5 (very low)

Shrink-swell potential: About 1.2 LEP (low)

Flooding hazard: None

Runoff class: Negligible

Hydrologic group: C

Ecological site name: Alkali Flat

Ecological site number: R042XB001NM

Present vegetation: Iodinebush

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 39.00 seconds N. and long. 106 degrees 26 minutes 7.90 seconds W.

Ayyz—0 to 4.5 inches (0 to 12 centimeters); light greenish gray (10Y 8/1) gypsiferous coarse sandy loam, light greenish gray (10Y 7/1) moist; 8 percent clay; weak very fine subangular blocky structure; moderately hard, very friable, nonsticky, nonplastic; many fine irregular gypsum crystals throughout; noneffervescent, 77 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 26.9 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

Cnyyz—4.5 to 23.5 inches (12 to 60 centimeters); light greenish gray (10Y 8/1) gypsiferous coarse sandy loam, light greenish gray (10Y 7/1) moist; 10 percent clay; massive; very hard, slightly rigid, nonsticky, nonplastic; many fine irregular gypsum crystals throughout; noneffervescent, 83 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 79.8 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cnyyzg1—23.5 to 34.5 inches (60 to 87 centimeters); light greenish gray (5GY 7/1) gypsiferous loamy sand, greenish gray (5GY 6/1) moist; 5 percent clay; massive; very hard, slightly rigid, nonsticky, nonplastic; many fine irregular gypsum crystals throughout; noneffervescent, 80 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 111.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cnyyzg2—34.5 to 60 inches (87 to 152 centimeters); light greenish gray (10GY 7/1) gypsiferous sandy loam, greenish gray (10GY 6/1) moist; 14 percent clay; massive; very hard, extremely firm, nonsticky, nonplastic; many fine irregular gypsum crystals throughout; noneffervescent, 85 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 116.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 6 to 15 percent
Ayyz horizon:
Hue—gley 1, 10YR, 2.5Y, 5Y, or 10Y
Value—2 to 9 dry; 3 to 8 moist
Chroma—neutral to 3, dry or moist
Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous loamy fine sand,
gypsiferous coarse sandy loam, gypsiferous sandy loam, or gypsiferous loam
Clay content—6 to 15 percent
Gypsum content—60 to 90 percent
Salinity—moderately saline or strongly saline

Cnyyz and Cnyyzg horizons:
Hue—gley 1, 10YR, 2.5Y, 5Y, 10Y, 5GY, or 10GY
Value—2 to 9 dry; 3 to 8 moist
Chroma—neutral to 3, dry or moist
Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous loamy fine sand,
gypsiferous coarse sandy loam, gypsiferous sandy loam, or gypsiferous loam
Clay content—3 to 20 percent
Gypsum content—60 to 90 percent
Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 4.5 inches (Ayyz horizon)
• Salic horizon—the zone from 4.5 to 60 inches (Cnyyz, Cnyzzg1, and Cnyyzg2 horizons)
• Episaturation—the zone from 0 to 19.5 inches

47—Loki-Jato-Hermes complex, 0 to 5 percent slopes

Map Unit Setting

Landform(s): Basin floors (fig. 58)
Elevation: 3,920 to 4,000 feet (1,195 to 1,220 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition
Loki and similar soils: 55 percent
Jato and similar soils: 25 percent
Hermes and similar soils: 15 percent
Minor components: 5 percent
  Basso and similar soils
  Globe and similar soils
  Nasa and similar soils
  Peligro and similar soils
  Talos and similar soils
  Ybar and similar soils

Description of the Loki Soil

Taxonomic classification: Loamy over coarse-gypseous, mixed over hypergypsic,
superactive, thermic Typic Calcigypsids
Geomorphic position: Relict lakebeds on basin floors
Parent material: Alluvium over gypsiferous lacustrine deposits
Slope: 0 to 2 percent
Surface cover
  Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
  cryptogamic crust—12 percent
  Chemical crust:
  salt—0 percent
  gypsum—0 percent
  Physical cover:
  canopy plant cover—60 percent
  woody debris—22 percent
  bare soil—20 percent
  rock fragments—0 percent

Depth to restrictive feature(s): 6 to 24 inches to strongly contrasting textural stratification

Drainage class: Well drained
$K_{sat}$ (solum): 0.57 inch to 39.69 inches per hour (4.00 to 280.00 micrometers per second)
Available water capacity (total inches): 3.3 (low)
Shrink-swell potential: About 3.0 LEP (moderate)
Flooding hazard: None
Runoff class: Low
Hydrologic group: B
Ecological site name: Gyp Upland

Figure 58.—An area of map unit 47 (Loki-Jato-Hermes complex, 0 to 5 percent slopes).
Ecological site number: R042XB006NM
Present vegetation: Alkali sacaton, fourwing saltbush, burrograss, bush muhly, Torrey’s jointfir, allthorn, cactus, honey mesquite, and tobosa
Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 59)

Location by Geographic Coordinate System: lat. 32 degrees 28 minutes 32.40 seconds N. and long. 106 degrees 23 minutes 11.00 seconds W.

A—0 to 3 inches (0 to 8 centimeters); light brown (7.5YR 6/3) silt loam, brown (7.5YR 4/3) moist; 22 percent clay; moderate thick platy over moderate medium and
weak fine subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few medium and many fine roots between peds; few medium and common fine vesicular pores; 3 percent medium iron-manganese masses throughout; finely disseminated carbonate throughout; strongly effervescent, 15 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 1.4 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bw—3 to 9 inches (8 to 23 centimeters); light brown (7.5YR 6/3) silt loam, brown (7.5YR 4/4) moist; 24 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium and common fine roots between peds; few medium and common fine dendritic tubular pores; finely disseminated carbonate throughout; violently effervescent, 24 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 3.6 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; abrupt wavy boundary.

Bk—9 to 18 inches (23 to 46 centimeters); pink (7.5YR 7/3) silt loam, brown (7.5YR 4/4) moist; 24 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, very sticky, very plastic; few very fine and common fine roots between peds; few fine tubular pores; finely disseminated gypsum throughout, common fine threadlike carbonate masses lining pores, and common fine spherical carbonate masses on faces of peds; violently effervescent, 37 percent calcium carbonate equivalent and 3 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 3.2 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 2.0; abrupt wavy boundary.

2Byy—18 to 26 inches (46 to 66 centimeters); 10 percent pale brown (10YR 6/3) and 90 percent white (7.5YR 8/1) gypsiferous loam, 10 percent dark yellowish brown (10YR 4/4) and 90 percent pink (7.5YR 7/3) moist; 12 percent clay; weak extremely coarse prismatic structure; moderately hard, friable, slightly sticky, slightly plastic; few very fine roots between peds; few fine tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; very slightly effervescent, 13 percent calcium carbonate equivalent and 62 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 2.6 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; gradual irregular boundary.

2Cyy1—26 to 36 inches (66 to 91 centimeters); 30 percent light brown (7.5YR 6/3) and 70 percent white (10YR 8/1) gypsiferous sand, 30 percent brown (7.5YR 5/4) and 70 percent very pale brown (10YR 7/3) moist; 3 percent clay; weak extremely coarse prismatic structure; moderately hard, firm, nonsticky, nonplastic; few coarse roots between peds; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 4 percent calcium carbonate equivalent and 90 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; gradual wavy boundary.

2Cyy2—36 to 46 inches (91 to 117 centimeters); 30 percent light brown (7.5YR 6/3) and 70 percent white (10YR 9.5/1) gypsiferous sand, 30 percent brown (7.5YR 5/4) and 70 percent white (10YR 9/1) moist; 3 percent clay; weak extremely coarse prismatic structure; moderately hard, firm, nonsticky, nonplastic; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 5 percent calcium carbonate equivalent and 81 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 4.5 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 4.0; abrupt wavy boundary.

2Cyy3—46 to 58 inches (117 to 147 centimeters); white (10YR 8.5/1) gypsiferous coarse sand, white (10YR 8/1) moist; 3 percent clay; massive; very hard, very firm, nonsticky, nonplastic; finely disseminated carbonate and many fine and many medium platy gypsum crystals throughout; strongly effervescent, 10 percent calcium carbonate equivalent and 79 percent gypsum; moderately alkaline, pH 8.4;
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electrical conductivity of 7.0 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 5.0; abrupt wavy boundary.

2Cyyz—58 to 60 inches (147 to 152 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 3 percent clay; massive; hard, very firm, nonsticky, nonplastic; 10 percent fine masses of oxidized iron in matrix; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; strongly effervescent, 12 percent calcium carbonate equivalent and 74 percent gypsum; moderately alkaline, pH 8.4; electrical conductivity of 10.0 dS/m (mmhos/cm); moderately saline; sodium adsorption ratio of 7.0.

Range in Characteristics

Clay content of control section (weighted average): 0 to 26 percent

Other characteristics: Some pedons do not have a Bw horizon

A horizon:
  Hue—7.5YR or 10YR
  Value—5 to 6 dry; 4 to 5 moist
  Chroma—2 to 4, dry or moist
  Texture—loam or silt loam
  Clay content—11 to 22 percent
  Reaction—slightly alkaline or moderately alkaline

Bw and Bk horizons:
  Hue—7.5YR or 10YR
  Value—4 to 7 dry; 3 to 4 moist
  Chroma—3 to 4, dry or moist
  Texture—loam or silt loam
  Clay content—18 to 26 percent
  Calcium carbonate equivalent—15 to 40 percent
  Reaction—slightly alkaline or moderately alkaline
  Salinity—nonsaline or very slightly saline

2Byy horizon:
  Hue—7.5YR or 10YR
  Value—6 to 8 dry; 4 to 7 moist
  Chroma—1 to 4, dry or moist
  Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous loam
  Clay content—2 to 27 percent
  Gypsum content—60 to 90 percent
  Reaction—slightly alkaline or moderately alkaline
  Salinity—nonsaline to slightly saline

2Cyy and 2Cyyz horizons:
  Hue—7.5YR, 10YR, or 2.5Y
  Value—6 to 9.5 dry; 5 to 9 moist
  Chroma—1 to 4, dry or moist
  Texture—gypsiferous coarse sand or gypsiferous sand
  Clay content—0 to 5 percent
  Gypsum content—70 to 90 percent
  Salinity—slightly saline to strongly saline

Diagnostic Features

• Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
• Calcic horizon—the zone from 9 to 18 inches (Bk horizon)
• Gypsic horizon—the zone from 18 to 26 inches (2Byy horizon)
• Depth to strongly contrasting particle-size class—18 inches (loamy over coarse-gypseous)

Description of the Jato Soil

Taxonomic classification: Loamy over coarse-gypseous, mixed over hypergypseic, superactive, thermic Typic Calcigypsids
Geomorphic position: Relict lakebeds on basin floors
Parent material: Alluvium over gypsiferous lacustrine deposits
Slope: 0 to 3 percent
Surface cover
   Biological crust:
       cyanobacteria—0 percent
       lichen—0 percent
       moss—0 percent
       cryptogamic crust—0 percent
   Chemical crust:
       salt—0 percent
       gypsum—0 percent
Physical cover:
   canopy plant cover—60 percent
   woody debris—25 percent
   bare soil—25 percent
   rock fragments—0 percent

Depth to restrictive feature(s): 20 to 34 inches to strongly contrasting textural stratification
Drainage class: Well drained

\[ K_{\text{sat}} \ (\text{solum}) \]: 0.57 inch to 19.98 inches per hour (4.00 to 141.00 micrometers per second)

Available water capacity (total inches): 4.1 (low)
Shrink-swell potential: About 2.7 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: B
Ecological site name: Loamy
Ecological site number: R042XB014NM
Present vegetation: Alkali sacaton, fourwing saltbush, honey mesquite, and tarbush
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 39 minutes 41.00 seconds N. and long. 106 degrees 14 minutes 40.40 seconds W.

A—0 to 6 inches (0 to 15 centimeters); pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; 22 percent clay; weak thick platy over moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; few fine irregular pores; finely disseminated carbonate throughout; strongly effervescent, 10 percent calcium carbonate equivalent; slightly effervescent, 10 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 2.1 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Bk1—6 to 23.5 inches (15 to 60 centimeters); pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; 20 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots throughout; common fine irregular pores; common medium irregular carbonate masses throughout; violently effervescent, 25 percent calcium carbonate equivalent;
slightly alkaline, pH 7.8; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

**Bk2**—23.5 to 33.5 inches (60 to 85 centimeters); pale brown (10YR 6/3) silt loam, light brownish gray (2.5Y 6/2) moist; 22 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; common medium irregular pores; finely disseminated gypsum and common fine irregular carbonate masses throughout; strongly effervescent, 20 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 3.1 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

**2Byy**—33.5 to 39.5 inches (85 to 100 centimeters); 40 percent light gray (2.5Y 7/2) and 60 percent white (2.5Y 7/2) gypsiferous loamy sand, 40 percent light yellowish brown (2.5Y 6/3) and 60 percent white (2.5Y 8/1) moist; 5 percent clay; 40 percent fine and medium distinct light olive brown (2.5Y 5/6) and 60 percent fine and medium distinct brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few medium irregular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; strongly effervescent, 4 percent calcium carbonate equivalent and 68 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

**2Cyy**—39.5 to 60 inches (100 to 152 centimeters); 25 percent yellowish brown (10YR 5/4) and 75 percent white (10YR 8.5/1) gypsiferous sandy loam, 25 percent brown (10YR 5/3) and 75 percent white (10YR 8/1) moist; 12 percent clay; massive; slightly hard, firm, slightly sticky, slightly plastic; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; strongly effervescent, 4 percent calcium carbonate equivalent and 75 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 3.8 dS/m (mmhos/cm); very slightly saline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 18 to 30 percent

**A horizon:**

- **Hue**—7.5YR or 10YR
- **Value**—5 to 6 dry; 4 to 5 moist
- **Chroma**—3 to 4, dry or moist
- **Texture**—loam or silt loam
- **Clay content**—15 to 25 percent
- **Reaction**—slightly alkaline or moderately alkaline
- **Salinity**—nonsaline or very slightly saline

**Bk horizons:**

- **Hue**—7.5YR or 10YR
- **Value**—5 to 6 dry; 4 to 6 moist
- **Chroma**—2 to 4, dry or moist
- **Texture**—loam or silt loam
- **Clay content**—20 to 30 percent
- **Calcium carbonate equivalent**—15 to 30 percent
- **Reaction**—slightly alkaline or moderately alkaline
- **Salinity**—nonsaline or very slightly saline

**2Byy and 2Cyy horizons:**

- **Hue**—10YR, 5Y, or 2.5Y
- **Value**—5 to 8.5 dry; 4 to 8 moist
- **Chroma**—1 to 6, dry or moist
Texture—gypsiferous coarse sand, gypsiferous sand, gypsiferous loamy sand, or gypsiferous sandy loam
Clay content—4 to 12 percent
Gypsum content—60 to 90 percent
Salinity—very slightly saline or slightly saline

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 6 inches (A horizon)
- Calcic horizon—the zone from 6 to 33.5 inches (Bk1 and Bk2 horizons)
- Gypsic horizon—the zone from 33.5 to 60 inches (2Byy and 2Cyy horizons)
- Depth to strongly contrasting particle-size class—33.5 inches (loamy over coarse-gypseous)

**Description of the Hermes Soil**

*Taxonomic classification:* Coarse-gypseous, hypergypsic, thermic Typic Petrogypsids
*Geomorphic position:* Relict lakebeds as low gypsum outcrops on basin floors
*Parent material:* Gypsiferous lacustrine deposits
*Slope:* 0 to 5 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—60 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—10 percent
- Physical cover:
  - canopy plant cover—25 percent
  - woody debris—10 percent
  - bare soil—15 percent
  - rock fragments—0 percent

*Depth to restrictive feature(s):* 20 to 24 inches to petrogypsic horizon
*Drainage class:* Well drained

$$K_{sat} \text{ (solum)}: 0.57 \text{ inch to 99.92 inches per hour (4.00 to 705.00 micrometers per second)}$$

$$K_{sat} \text{ (restrictive layer)}: 0.00 \text{ to 0.06 inch per hour (0.01 to 0.42 micrometer per second)}$$

*Available water capacity (total inches):* 1.9 (very low)
*Shrink-swell potential:* About 1.9 LEP (low)
*Flooding hazard:* None
*Runoff class:* Low
*Hydrologic group:* C

**Ecological site name:** Gyp Outcrop
**Ecological site number:** R042X8007NM
**Present vegetation:** Hairy coldenia and gyp dropseed
**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon** (fig. 60)

*Location by Geographic Coordinate System:* lat. 32 degrees 28 minutes 53.17 seconds N. and long. 106 degrees 21 minutes 24.32 seconds W.

An—0 to 3 inches (0 to 8 centimeters); light brown (7.5YR 6/3) loam, brown (7.5YR 4/3) moist; 20 percent clay; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; few very fine irregular pores; common fine irregular
carbonate masses throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 6 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 2.8 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 27.0; abrupt smooth boundary.
Bnyy1—3 to 13 inches (8 to 33 centimeters); white (10YR 8.5/1) gypsiferous sand, white (10YR 8/1) moist; 3 percent clay; weak medium subangular blocky structure; hard, very firm, nonsticky, nonplastic; few very fine roots throughout; few fine irregular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; very slightly effervescent, 2 percent calcium carbonate equivalent and 73 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 35.0; gradual smooth boundary.

Bnyy2—13 to 23 inches (33 to 58 centimeters); white (10YR 8.5/1) gypsiferous sand, white (10YR 8/1) moist; 5 percent clay; weak medium subangular blocky structure; hard, very firm, nonsticky, nonplastic; few very fine roots throughout; few medium irregular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; very slightly effervescent, 2 percent calcium carbonate equivalent and 87 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 2.5 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 22.0; abrupt smooth boundary.

Bnyym1—23 to 35 inches (58 to 89 centimeters); 5 percent light yellowish brown (10YR 6/4) and 95 percent white (10YR 9.5/1) cemented material, 5 percent yellowish brown (10YR 5/4) and 95 percent white (10YR 9/1) moist; massive; finely disseminated carbonate and many fine irregular gypsum crystals throughout; strongly effervescent, 9 percent calcium carbonate equivalent and 96 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 2.7 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 83.0; diffuse smooth boundary.

Bnyym2—35 to 50 inches (89 to 127 centimeters); white (10YR 9.5/1) cemented material, white (10YR 9/1) moist; massive; finely disseminated carbonate and many fine irregular gypsum crystals throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 92 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 3.2 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 89.0; abrupt smooth boundary.

Cnyy—50 to 60 inches (127 to 152 centimeters); 10 percent light yellowish brown (10YR 6/4) and 90 percent white (10YR 9/1) gypsiferous sand, 10 percent yellowish brown (10YR 5/4) and 90 percent white (10YR 8.5/1) moist; 3 percent clay; massive; moderately hard, firm, nonsticky, nonplastic; finely disseminated carbonate and many fine irregular gypsum crystals throughout; very slightly effervescent, 4 percent calcium carbonate equivalent and 73 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 100.0.

**Range in Characteristics**

*Clay content of control section (weighted average):* 3 to 8 percent

**An horizon:**
- Hue—7.5YR or 10YR
- Value—6 to 7 dry; 4 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—very fine sandy loam, gypsiferous loam, or loam
- Clay content—12 to 20 percent
- Reaction—slightly alkaline or moderately alkaline

**Bnyy horizons:**
- Hue—10YR or 2.5Y
- Value—8 to 9.5 dry; 7 to 8.5 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand or gypsiferous loamy sand
Clay content—3 to 8 percent
Gypsum content—70 to 96 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline or slightly saline
Sodium adsorption ratio—greater than 13

Bnyym horizons:
- Cemented material—gypsum
- Hardness—extremely hard or indurated
- Thickness—23 to 50 inches; laterally continuous

Cnyy horizon:
- Hue—10YR or 2.5Y
- Value—6 to 9.5 dry; 5 to 8.5 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sand or gypsiferous loamy sand
- Clay content—0 to 5 percent
- Gypsum content—70 to 100 percent
- Salinity—very slightly saline or slightly saline

Diagnostic Features
- Ochric horizon—the zone from 0 to 3 inches (An horizon)
- Gypsic horizon—the zone from 3 to 23 inches (Bnyy1 and Bnyy2 horizons)
- Petrogypsic horizon—the zone from 23 to 50 inches (Bnyym1 and Bnyym2 horizons)

48—Mallet-Kimrose-Stronghold complex, 5 to 20 percent slopes

Map Unit Setting

Landform(s): Fan remnants (fig. 61)
Elevation: 4,100 to 6,790 feet (1,249 to 2,071 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 61 to 64 degrees F (16.0 to 18.0 degrees C)
Mean annual soil temperature: 63 to 66 degrees F (17.1 to 19.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-3 Chihuahuan Desert Grassland

Map Unit Composition

Mallet and similar soils: 40 percent
Kimrose and similar soils: 30 percent
Stronghold and similar soils: 20 percent
Minor components: 10 percent
- Lithic Ustic Haplocambids
- Ustic Petrocalcids
- Riverwash
- Rock outcrop

Description of the Mallet Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Ustic Haplocambids
Geomorphic position: All positions of fan remnants
Parent material: Mixed alluvium
Slope: 5 to 15 percent
Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—47 percent
- woody debris—5 percent
- bare soil—30 percent
- rock fragments—20 percent gravel and 1 percent cobbles

Drainage class: Somewhat excessively drained

\( K_{sat} \) (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

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

Shrink-swell potential: About 1.3 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: A

Ecological site name: Sandy

Ecological site number: R042XC004NM

Present vegetation: Black grama, mesquite, snakeweed, and yucca

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 40 minutes 2.50 seconds N. and long. 106 degrees 24 minutes 30.00 seconds W.

A—0 to 4.5 inches (0 to 12 centimeters); brown (7.5YR 4/2) gravelly fine sandy loam, dark brown (7.5YR 3/2) moist; 15 percent clay; weak fine granular structure;
soft, friable, slightly sticky, slightly plastic; common very fine and few fine roots throughout; few very fine and fine dendritic tubular pores; 25 percent gravel and 1 percent cobbles; noneffervescent; slightly alkaline, pH 7.5; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bw1—4.5 to 25.5 inches (12 to 65 centimeters); brown (7.5YR 4/3) gravelly fine sandy loam, dark brown (7.5YR 3/3) moist; 16 percent clay; weak fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common very fine and few fine roots throughout; few very fine and fine dendritic tubular pores; 25 percent gravel and 1 percent cobbles; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bw2—25.5 to 43.5 inches (65 to 110 centimeters); brown (7.5YR 4/3) gravelly fine sandy loam, dark brown (7.5YR 3/3) moist; 18 percent clay; weak fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; few very fine and fine dendritic tubular pores; 30 percent gravel and 1 percent cobbles; slightly effervescent, 1 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Ck—43.5 to 60 inches (110 to 152 centimeters); brown (7.5YR 5/2) loamy sand, brown (7.5YR 4/3) moist; 8 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine roots throughout; many very fine interstitial pores; finely disseminated carbonate throughout; 10 percent gravel; strongly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 14 to 18 percent

*Rock fragment content in control section: *15 to 35 percent

**A horizon:**
- Hue—7.5YR or 10YR
- Value—3 to 5 dry; 2.5 to 4 moist
- Chroma—2 to 3, dry or moist
- Texture—sandy loam, fine sandy loam, or loam
- Clay content—10 to 18 percent
- Rock fragment content—15 to 34 percent
- Reaction—slightly alkaline or moderately alkaline

**Bw horizons:**
- Hue—7.5YR or 10YR
- Value—3 to 5 dry; 2.5 to 4 moist
- Chroma—2 to 3, dry or moist
- Texture—sandy loam, fine sandy loam, or loam
- Clay content—14 to 18 percent
- Rock fragment content—15 to 34 percent
- Reaction—slightly alkaline or moderately alkaline

**Ck horizon:**
- Hue—7.5YR or 10YR
- Value—4 to 8 dry; 4 to 5 moist
- Chroma—2 to 3, dry or moist
- Texture—sand, loamy sand, or sandy loam
- Clay content—5 to 15 percent
- Rock fragment content—0 to 34 percent
- Reaction—slightly alkaline or moderately alkaline
Diagnostic Features

- Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
- Cambic horizon—the zone from 5 to 43.5 inches (Bw1 and Bw2 horizons)

Description of the Kimrose Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic, shallow Calcic Petrocalcids

Geomorphic position: All positions of fan remnants

Parent material: Mixed alluvium

Slope: 5 to 20 percent

Surface cover

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

Physical cover:

- canopy plant cover—38 percent
- woody debris—5 percent
- bare soil—25 percent
- rock fragments—30 percent gravel, 5 percent cobbles, and 1 percent stones

Depth to restrictive feature(s): 9 to 14 inches to petrocalcic horizon

Drainage class: Well drained

\( K_{sat} \) (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

\( K_{sat} \) (restrictive layer): 0.00 inches per hour (0.00 to 0.02 micrometer per second)

Available water capacity (total inches): 0.9 (very low)

Shrink-swell potential: About 1.9 LEP (low)

Flooding hazard: None

Runoff class: Very high

Hydrologic group: D

Ecological site name: Gravelly

Ecological site number: R042XC001NM

Present vegetation: Black grama, honey mesquite, and snakeweed

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 44 minutes 40.10 seconds N. and long. 106 degrees 23 minutes 58.20 seconds W.

A—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/2) very gravelly sandy loam, brown (7.5YR 4/2) moist; 16 percent clay; weak fine granular structure; soft, friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 33 percent gravel and 3 percent cobbles; strongly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk—4 to 13.5 inches (10 to 34 centimeters); light brown (7.5YR 6/3) very gravelly sandy loam, brown (7.5YR 5/2) moist; 18 percent clay; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; few fine dendritic tubular pores; common distinct carbonate coats on rock fragments; finely disseminated carbonate and common fine irregular and common very fine threadlike carbonate masses throughout; 35
percent gravel and 1 percent cobbles; violently effervescent, 21 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

2Bkkm—13.5 to 25.5 inches (34 to 65 centimeters); light gray (7.5YR 7/1) cemented material, pinkish gray (7.5YR 7/2) moist; massive; few very fine roots at top of horizon; violently effervescent, 30 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

2Bk—25.5 to 60 inches (65 to 152 centimeters); light gray (10YR 7/2) very gravelly sandy clay loam, light brownish gray (10YR 6/2) moist; 25 percent clay; weak fine and medium subangular blocky structure; very hard, very firm, slightly sticky, nonplastic; few fine dendritic tubular pores; common distinct carbonate coats on rock fragments; finely disseminated carbonate and common fine irregular carbonate masses throughout; 35 percent gravel and 5 percent cobbles; violently effervescent, 25 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 16 to 18 percent
Rock fragment content in control section: 35 to 55 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 3 to 5 moist
- Chroma—2 to 3, dry or moist
- Clay content—15 to 18 percent
- Rock fragment content—25 to 45 percent
- Reaction—slightly alkaline or moderately alkaline

Bk and 2Bk horizons:
- Hue—7.5YR or 10YR
- Value—5 to 7, dry or moist
- Chroma—2 to 4, dry or moist
- Texture—sandy loam, sandy clay loam, or clay loam
- Clay content—18 to 30 percent
- Rock fragment content—35 to 55 percent
- Calcium carbonate equivalent—15 to 25 percent
- Reaction—slightly alkaline or moderately alkaline

2Bkkm horizon:
- Cemented material—calcium carbonate
- Hardness—extremely hard or indurated
- Thickness—6 to 22 inches; laterally continuous

Diagnostic Features

- Ochric epipedon—the zone from 0 to 4 inches (A and Bk horizons)
- Calcic horizon—the zone from 4 to 13.5 inches (Bk horizon)
- Petrocalcic horizon—the zone from 13 to 25.5 inches (2Bkkm horizon)

Description of the Stronghold Soil

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

Geomorphic position: All positions of fan remnants
Parent material: Mixed alluvium
Slope: 5 to 15 percent
Surface cover
Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
  cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—50 percent
  woody debris—5 percent
  bare soil—65 percent
  rock fragments—0 percent

Drainage class: Somewhat excessively drained

$K_{\text{sat}}$ (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity (total inches): 5.7 (moderate)

Shrink-swell potential: About 0.9 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: A

Ecological site name: Sandy

Ecological site number: R042XC004NM

Present vegetation: Blue grama, dropseed, soaptree yucca, and winterfat

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 43 minutes 21.90 seconds N. and long. 106 degrees 23 minutes 26.70 seconds W.

A—0 to 3 inches (0 to 8 centimeters); yellowish brown (10YR 5/4) loamy coarse sand, dark brown (10YR 3/3) moist; 6 percent clay; single grain; loose, loose, nonsticky, nonplastic; many very fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent gravel; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; clear smooth boundary.

Bw—3 to 16 inches (8 to 41 centimeters); dark yellowish brown (10YR 4/4) coarse sandy loam, dark brown (10YR 3/3) moist; 8 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent gravel; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk—16 to 27 inches (41 to 69 centimeters); brown (7.5YR 4/4) sandy loam, dark brown (7.5YR 3/4) moist; 10 percent clay; weak coarse subangular blocky structure parting to moderate medium subangular blocky; soft, very friable, slightly sticky, nonplastic; few very fine roots throughout; few very fine dendritic tubular pores; few distinct carbonate coats on rock fragments; finely disseminated carbonate and common very fine spherical carbonate masses throughout; 12 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; diffuse wavy boundary.

BCk—27 to 45 inches (69 to 114 centimeters); brown (7.5YR 4/4) sandy loam, dark brown (7.5YR 3/4) moist; 8 percent clay; weak coarse subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few very fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent
gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; diffuse wavy boundary.

Ck—45 to 60 inches (114 to 152 centimeters); strong brown (7.5YR 5/6) loamy coarse sand, strong brown (7.5YR 4/6) moist; 5 percent clay; massive; loose, loose, nonsticky, nonplastic; few very fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent gravel; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content of control section (weighted average): 12 to 15 percent
Rock fragment content in control section: 0 to 15 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—loamy sand, loamy coarse sand, or sandy loam
- Clay content—5 to 10 percent
- Reaction—slightly alkaline or moderately alkaline

Bw horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 4 moist
- Chroma—3 to 6, dry or moist
- Texture—coarse sandy loam, sandy loam, or loam
- Clay content—5 to 14 percent

Bk, BCk, and Ck horizons:
- Hue—7.5YR or 10YR
- Value—4 to 8 dry; 3 to 4 moist
- Chroma—3 to 6, dry or moist
- Texture—loamy sand, loamy coarse sand, sandy loam, or loam
- Clay content—2 to 16 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 3 to 16 inches (Bw horizon)
- Calcic horizon—the zone from 16 to 27 inches (Bk horizon)

49—Malpaispring-Water association, 0 to 3 percent slopes

Map Unit Setting

Landform(s): Alluvial flats (fig. 62)
Elevation: 4,150 to 4,170 feet (1,265 to 1,270 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Malpaispring and similar soils: 88 percent
Water: 5 percent
Minor components: 7 percent
  - Gypsic Aquisalids with a coarse-gypseous particle-size class and similar soils
  - Gypsic Haplosalids and similar soils
  - Gyplaya and similar soils
  - Marshland

Description of the Malpaispring Soil

*Taxonomic classification:* Fine-gypseous, hypergypsic, thermic Gypsic Aquisalids
*Geomorphic position:* Salt marshes at the terminus of the Carrizo lava flow
*Parent material:* Gypsiferous eolian deposits
*Slope:* 0 to 3 percent
*Surface cover*
  - Biological crust:
    - cyanobacteria—0 percent
    - lichen—0 percent
    - moss—0 percent
    - cryptogamic crust—0 percent
  - Chemical crust:
    - salt—10 percent
    - gypsum—0 percent
  - Physical cover:
    - canopy plant cover—75 percent
    - woody debris—15 percent

Figure 62.—An area of map unit 49 (Malpaispring-Water association, 0 to 3 percent slopes).
bare soil—10 percent
rock fragments—0 percent

**Depth to restrictive feature(s):** 0 to 2 inches to salic horizon

**Drainage class:** Poorly drained

**K\text{sat}** *(solum):* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

**Available water capacity (total inches):** 0.0 (very low)

**Shrink-swell potential:** About 1.2 LEP (low)

**Flooding hazard:** Occasional

**Depth to seasonal high water table (minimum):** About 0 to 40 inches

**Runoff class:** Negligible

**Hydrologic group:** A/D

**Ecological site name:** Salt Meadow

**Ecological site number:** R042XB028NM

**Present vegetation:** Alkali sacaton, inland saltgrass, iodinebush, and sedges

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 33 degrees 17 minutes 17.70 seconds N. and long. 106 degrees 19 minutes 17.70 seconds W.

**Anyyz**—0 to 3 inches (0 to 8 centimeters); white (10YR 8/1) gypsiferous loam, very pale brown (10YR 8/4) moist; 15 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots throughout; few fine dendritic tubular pores; finely disseminated salt and carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 98 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 44.0 dS/m (mmhos/cm); strongly saline; clear wavy boundary.

**Bnyyz1**—3 to 8.5 inches (8 to 22 centimeters); white (7.5YR 8/1) gypsiferous loam, pink (7.5YR 7/3) moist; 13 percent clay; 5 percent fine yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and many coarse roots throughout; common coarse dendritic tubular pores; few distinct grayish brown (10YR 5/2), moist, organic stains on surfaces along root channels; finely disseminated salt and carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 97 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 70.0 dS/m (mmhos/cm); strongly saline; gradual wavy boundary.

**Bnyyz2**—8.5 to 18.5 inches (22 to 47 centimeters); white (7.5YR 8/1) gypsiferous loam, pale brown (10YR 6/3) moist; 10 percent clay; 5 percent fine yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium and common fine roots throughout; few fine dendritic tubular pores; few distinct very dark gray (2.5Y 3/1), moist, organic stains on surfaces along root channels; finely disseminated salt and carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 83 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 30.0 dS/m (mmhos/cm); strongly saline; gradual wavy boundary.

**Byy**—18.5 to 60 inches (47 to 152 centimeters); white (7.5YR 8/1) gypsiferous very fine sandy loam, pale brown (10YR 6/3) moist; 12 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 84 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 7.0 dS/m (mmhos/cm); slightly saline.
Range in Characteristics

Clay content of control section (weighted average): 5 to 20 percent

Anyyz horizon:
- Hue—7.5YR, 10YR, or 2.5Y
- Value—5 to 9 dry; 4 to 8 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sandy loam or gypsiferous loam
- Clay content—5 to 20 percent
- Gypsum content—70 to 100 percent

Bnyyz horizons:
- Hue—7.5YR, 10YR, or 2.5Y
- Value—5 to 9.5 dry; 4 to 8 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous fine sandy loam, gypsiferous very fine sandy loam, or gypsiferous loam
- Clay content—5 to 20 percent
- Gypsum content—70 to 100 percent

Byy horizon:
- Hue—7.5YR, 10YR, or 2.5Y
- Value—5 to 9.5 dry; 4 to 8 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous fine sandy loam, gypsiferous very fine sandy loam, or gypsiferous silt loam
- Clay content—5 to 20 percent
- Gypsum content—70 to 100 percent
- Salinity—slightly saline or moderately saline

Diagnostic Features

- Ochric epipedon—the zone from 0 to 3 inches (Anyyz horizon)
- Gypsic horizon—the zone from 3 to 60 inches (Bnyyz1, Bnyyz2, and Byy horizons)
- Salic horizon—the zone from 0 to 18.5 inches (Anyyz, Bnyyz1, and Bnyyz2 horizons)

Description of Water

This component consists of streams, lakes, and ponds. These areas are covered with water in most years, at least during the period that is warm enough for plants to grow. Many areas are covered throughout the year.

50—Mamtrack-Lark-Transformer complex, 0 to 15 percent slopes

Map Unit Setting

Landform(s): Dunes, interdunes, and shore complexes (fig. 63)
Elevation: 3,900 to 3,970 feet (1,188 to 1,209 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Mamtrack and similar soils: 45 percent
Lark and similar soils: 30 percent
Transformer and similar soils: 20 percent
Minor components: 5 percent
  Gypsic Haplosalids and similar soils
  Petrogypsic Haplosalids and similar soils
  Typic Torriorthents and similar soils

Description of the Mamtrack Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: Relict shorelines on relict shore complexes
Parent material: Gysiferous eolian deposits and/or gysiferous lacustrine deposits
Slope: 0 to 10 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—20 percent
    woody debris—0 percent
    bare soil—85 percent
    rock fragments—0 percent

Drainage class: Well drained
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\( K_{sat} \) (solum): 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity (total inches): 10.4 (very high)

Shrink-swell potential: About 1.7 LEP (low)

Flooding hazard: None

Ponding hazard: None

Runoff class: Low

Hydrologic group: C

Ecological site name: Gyp Playa Step

Ecological site number: R042XB029NM

Present vegetation: Iodinebush

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 52 minutes 15.20 seconds N. and long. 106 degrees 18 minutes 24.00 seconds W.

Anyyz—0 to 4 inches (0 to 10 centimeters); white (2.5Y 9.5/1) gypsiferous fine sandy loam, white (2.5Y 8/1) moist; 8 percent clay; moderate thick platy structure; moderately hard, friable, nonsticky, slightly plastic; finely disseminated salt and gypsum throughout; non-effervescent, 0 percent calcium carbonate equivalent and 71 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 25.0 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

Byyz—4 to 12.5 inches (10 to 32 centimeters); light yellowish brown (10YR 6/4) gypsiferous clay loam, yellowish brown (10YR 5/4) moist; 30 percent clay; 2 percent coarse distinct black (5Y 2.5/1) mottles; strong coarse subangular blocky structure parting to strong medium subangular blocky; moderately hard, firm, moderately sticky, moderately plastic; few coarse roots throughout; a few coarse dendritic tubular pores; finely disseminated gypsum, salt, and carbonate and common very fine and medium irregular gypsum crystal clusters throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 52 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 19.0 dS/m (mmhos/cm); strongly saline; clear wavy boundary.

Cyyz—12.5 to 33 inches (32 to 84 centimeters); white (10YR 8/1) gypsiferous sandy clay loam, white (10YR 9/1) moist; 26 percent clay; massive; very hard, very firm, moderately sticky, slightly plastic; finely disseminated gypsum, salt, and carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 74 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 16.2 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cyyzg1—33 to 38.5 inches (84 to 98 centimeters); light bluish gray (10B 7/1) gypsiferous sandy clay loam, dark greenish gray (10BG 4/1) moist; 25 percent clay; massive; moderately hard, firm, slightly sticky, slightly plastic; finely disseminated gypsum, salt, and carbonate throughout; slightly effervescent, 5 percent calcium carbonate equivalent and 66 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 9.8 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Cyyzg2—38.5 to 60 inches (98 to 152 centimeters); light bluish gray (10B 7/1) gypsiferous silt loam, bluish gray (10B 5/1) moist; 22 percent clay; massive; moderately hard, firm, slightly sticky, slightly plastic; finely disseminated gypsum, salt, and carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 68 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 12.6 dS/m (mmhos/cm); moderately saline.

Range in Characteristics

Clay content of control section (weighted average): 18 to 30 percent
Anyzz horizon:
   Value—8 to 9.5 dry; 7 to 8 moist
   Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous loam
   Clay content—8 to 18 percent
   Gypsum content—40 to 90 percent
   Reaction—slightly alkaline or moderately alkaline
   Salinity—moderately saline or strongly saline

Byyyz horizon:
   Hue—10YR or 7.5YR
   Value—5 to 7 dry; 3 to 5 moist
   Chroma—3 to 4, dry or moist
   Texture—gypsiferous sandy clay loam, gypsiferous loam, gypsiferous silt loam, or gypsiferous clay loam
   Clay content—18 to 30 percent
   Calcium carbonate equivalent—0 to 2 percent
   Gypsum content—40 to 90 percent
   Reaction—slightly alkaline or moderately alkaline
   Salinity—moderately saline or strongly saline

Cyyzz horizon:
   Hue—7.5YR, 10YR, or 10BG
   Value—6 to 8 dry; 4 to 9 moist
   Chroma—1 to 6, dry or moist
   Texture—gypsiferous sandy clay loam, gypsiferous loam, or gypsiferous silt loam
   Clay content—18 to 35 percent
   Calcium carbonate equivalent—0 to 5 percent
   Gypsum content—40 to 90 percent
   Reaction—slightly alkaline or moderately alkaline
   Salinity—moderately saline or strongly saline

Cyyzg horizons:
   Hue—neutral, 5BG, 10BG, 10B, or 5PB
   Value—6 to 9 moist
   Texture—gypsiferous sandy clay loam, gypsiferous loam, gypsiferous silt loam, or gypsiferous clay loam
   Clay content—18 to 35 percent
   Calcium carbonate equivalent—1 to 5 percent
   Gypsum content—40 to 100 percent
   Reaction—slightly alkaline or moderately alkaline
   Salinity—slightly saline or moderately saline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 4 inches (Anyzz horizon)
- Gypsic horizon—the zone from 4 to 12.5 inches (Byyyz horizon)

Description of the Lark Soil

Taxonomic classification: Hypergypsic, thermic Typic Torripsamments
Geomorphic position: Active sand sheets and dunes on relict shore complexes
Parent material: Gypsiferous eolian sands
Slope: 0 to 15 percent
Surface cover
   Biological crust:
      cyanobacteria—0 percent
lichens—0 percent
moss—0 percent
cryptogamic crust—0 percent

Chemical crust:
salt—0 percent
gypsum—0 percent

Physical cover:
canopy plant cover—2 percent
woody debris—0 percent
bare soil—98 percent
rock fragments—0 percent

Drainage class: Excessively drained

K\text{sat} (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

Available water capacity (total inches): 35.9 (very high)

Shrink-swell potential: About 0.6 LEP (low)

Flooding hazard: None
Ponding hazard: None
Runoff class: Very low
Hydrologic group: A

Ecological site name: Vegetated Gypsum Dunes
Ecological site number: R042XB003NM

Present vegetation: Alkali sacaton, saltcedar, and Torrey ephedra

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 47 minutes 34.50 seconds N. and long. 106 degrees 19 minutes 47.80 seconds W.

Cyy1—0 to 2 inches (0 to 5 centimeters); white (2.5Y 8/1) gypsiferous coarse sand, light gray (2.5Y 7/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many medium interstitial pores; finely disseminated gypsum and carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 82 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 5.8 dS/m (mmhos/cm); slightly saline; clear smooth boundary.

Cyy2—2 to 60 inches (5 to 152 centimeters); white (2.5Y 8/1) gypsiferous sand, light gray (2.5Y 7/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many medium interstitial pores; finely disseminated gypsum and carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 82 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 5.8 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 2 percent

Cyy horizons:

Hue—10YR or 2.5Y
Value—7 to 9 dry; 7 to 8 moist
Chroma—1 to 2, dry or moist
Texture—gypsiferous coarse sand, gypsiferous sand, gypsiferous fine sand, gypsiferous loamy sand, or gypsiferous loamy fine sand

Clay content—0 to 5 percent
Calcium carbonate equivalent—0 to 4 percent
Gypsum content—40 to 100 percent

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Description of the Transformer Soil

**Taxonomic classification:** Hypergypsic, thermic Oxyaquic Torripsamments  
**Geomorphic position:** Active sand sheets and interdunes on relict shore complexes  
**Parent material:** Gypsiferous eolian sands  
**Slope:** 0 to 2 percent  
**Surface cover**  
Biological crust:  
- cyanobacteria—0 percent  
- lichen—0 percent  
- moss—0 percent  
- cryptogamic crust—0 percent  
Chemical crust:  
- salt—0 percent  
- gypsum—0 percent  
Physical cover:  
- canopy plant cover—20 percent  
- woody debris—0 percent  
- bare soil—90 percent  
- rock fragments—0 percent  
**Drainage class:** Moderately well drained  
\[K_{sat} (solum): \text{1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)}\]  
**Available water capacity (total inches):** 35.9 (very high)  
**Shrink-swell potential:** About 1.1 LEP (low)  
**Flooding hazard:** None  
**Ponding hazard:** Rare  
**Depth to seasonal high water table (minimum):** About 20 to 39 inches  
**Runoff class:** Negligible  
**Hydrologic group:** B  
**Ecological site name:** Gyp Interdune (Wet)  
**Ecological site number:** R042XB004NM  
**Present vegetation:** Saltcedar and Torrey ephedra  
**Land capability classification (nonirrigated areas):** 7c

Typical Pedon

**Location by Geographic Coordinate System:** lat. 32 degrees 52 minutes 16.00 seconds N. and long. 106 degrees 18 minutes 11.00 seconds W.

Cyy—0 to 4 inches (0 to 10 centimeters); white (2.5Y 8/1) gypsiferous sand, light gray (2.5Y 7/2) moist; 2 percent clay; moderate medium subangular blocky structure parting to single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; many fine irregular gypsum crystals throughout; slightly effervescent, 0 percent calcium carbonate equivalent and 78 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 10.9 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Cyy1—4 to 16.5 inches (10 to 42 centimeters); white (2.5Y 8/1) gypsiferous sand, 10 percent pale yellow (2.5Y 7/3) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; many fine irregular gypsum crystals throughout; noneffervescent, 0 percent calcium carbonate equivalent and 80 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 5.3 dS/m (mmhos/cm); slightly saline; clear smooth boundary.

Cyy2—16.5 to 35.5 inches (42 to 90 centimeters); white (10YR 9/1) gypsiferous loamy sand, white (10YR 8.5/1) moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; strongly effervescent, 5 percent calcium carbonate
equivalent and 66 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 4.3 dS/m (mmhos/cm); slightly saline; gradual smooth boundary.

Ckyy—35.5 to 60 inches (90 to 152 centimeters); white (2.5Y 8/1) gypsiferous loamy sand, light gray (2.5Y 7/2) moist; 10 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; strongly effervescent, 23 percent calcium carbonate equivalent and 67 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 6.8 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 2 to 4 percent

Other characteristics: Some pedons do not have a Ckyy horizon

Cyyz, Cyy, and Ckyy horizons:

- Hue—10YR or 2.5Y
- Value—7 to 9 dry; 7 to 8.5 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous coarse sand, gypsiferous sand, gypsiferous fine sand, gypsiferous loamy sand, or gypsiferous loamy fine sand
- Clay content—0 to 10 percent
- Calcium carbonate equivalent—0 to 25 percent
- Gypsum content—40 to 100 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—slightly saline to strongly saline

Diagnostic Features

- Endosaturation—the zone from 35 to 60 inches

51—Marconi-Prelo-Riverwash complex, 0 to 8 percent slopes

Map Unit Setting

Landform(s): Channels and drainageways (fig. 64)

Elevation: 4,100 to 5,870 feet (1,250 to 1,790 meters)

Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)

Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)

Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)

Frost-free period: 180 to 240 days

Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains

Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Marconi and similar soils: 45 percent
Prelo and similar soils: 35 percent
Riverwash: 15 percent
Minor components: 5 percent
- Adelino and similar soils
- Pajarito and similar soils
- Stagecoach and similar soils

Description of the Marconi Soil

Taxonomic classification: Fine, mixed, superactive, thermic Typic Haplocambids

Geomorphic position: Broad flood plains
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Parent material: Clayey alluvium derived from shale and siltstone
Slope: 0 to 3 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—40 percent
  woody debris—14 percent
  bare soil—53 percent
  rock fragments—0 percent
Drainage class: Well drained

$K_{sat}$ (solum): 0.06 to 0.57 inch per hour (0.42 micrometer to 4.00 micrometers per second)
Available water capacity (total inches): 10.8 (very high)
Shrink-swell potential: About 6.2 LEP (high)
Flooding hazard: Occasional
Runoff class: Medium
Hydrologic group: C
Ecological site name: Draw
Ecological site number: R042XB016NM
Present vegetation: Creosote bush and tobosa
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 34 minutes 44.00 seconds N. and long. 106 degrees 6 minutes 22.40 seconds W.
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A—0 to 4 inches (0 to 10 centimeters); reddish brown (5YR 5/4) silty clay loam, dark reddish brown (5YR 3/4) moist; 28 percent clay; moderate thick platy over moderate medium fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine tubular pores; finely disseminated carbonate throughout; 4 percent gravel; strongly effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw—4 to 16 inches (10 to 41 centimeters); reddish brown (5YR 4/4) silty clay loam, dark reddish brown (5YR 3/4) moist; 38 percent clay; strong medium and coarse subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; few very fine roots throughout; few very fine tubular pores; finely disseminated carbonate throughout; 4 percent gravel; strongly effervescent, 13 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 3.3 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Bk1—16 to 30 inches (41 to 76 centimeters); reddish brown (5YR 4/4) silty clay, dark reddish brown (5YR 3/4) moist; 42 percent clay; moderate medium subangular blocky structure; extremely hard, very firm, moderately sticky, moderately plastic; few very fine roots throughout; few very fine tubular pores; finely disseminated carbonate and few fine irregular carbonate masses throughout; 4 percent gravel; strongly effervescent, 13 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Bk2—30 to 41 inches (76 to 104 centimeters); reddish brown (5YR 5/4) silty clay loam, dark reddish brown (5YR 3/4) moist; 38 percent clay; moderate medium subangular blocky structure; extremely hard, very firm, moderately sticky, moderately plastic; few very fine roots throughout; few very fine tubular pores; finely disseminated carbonate and common fine irregular carbonate masses throughout; 4 percent gravel; strongly effervescent, 14 percent calcium carbonate equivalent; slightly alkaline, pH 7.5; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Bk3—41 to 60 inches (104 to 152 centimeters); light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 4/3) moist; 32 percent clay; moderate medium subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; finely disseminated carbonate and gypsum and common fine irregular carbonate masses throughout; 4 percent gravel; strongly effervescent, 14 percent calcium carbonate equivalent and 3 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 2.7 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 35 to 50 percent

A horizon:

Hue—2.5YR, 5YR, or 7.5YR
Value—4 to 5 dry; 3 to 4 moist
Chroma—3 to 6, dry or moist
Texture—clay loam, silt loam, or silty clay loam
Clay content—20 to 38 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline to slightly saline

Bw horizon:

Hue—2.5YR or 5YR
Value—3 to 5 dry; 3 to 4 moist
Chroma—3 to 5, dry or moist
Texture—silt loam, clay loam, or silty clay loam
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Clay content—25 to 40 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline or slightly saline

Bk horizons:
- Hue—2.5YR, 5YR, or 7.5YR
- Value—4 to 6 dry; 3 to 4 moist
- Chroma—3 to 6, dry or moist
- Texture—clay loam, silty clay loam, or silty clay
- Clay content—32 to 50 percent
- Calcium carbonate equivalent—6 to 17 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 4 to 60 inches (Bw, Bk1, Bk2, and Bk3 horizons)

Description of the Prelo Soil

Taxonomic classification: Fine-silty, gypsic, thermic Typic Haplogypsids
Geomorphic position: Broad drainageways
Parent material: Fine-silty alluvium
Slope: 0 to 3 percent
Surface cover
  - Biological crust:
    - cyanobacteria—0 percent
    - lichen—0 percent
    - moss—0 percent
    - cryptogamic crust—0 percent
  - Chemical crust:
    - salt—0 percent
    - gypsum—0 percent
  - Physical cover:
    - canopy plant cover—60 percent
    - woody debris—18 percent
    - bare soil—25 percent
    - rock fragments—0 percent

Drainage class: Well drained
\( K_{sat} \) (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)
Available water capacity (total inches): 11.3 (very high)
Shrink-swell potential: About 2.6 LEP (low)
Flooding hazard: Rare
Runoff class: Low
Hydrologic group: C
Ecological site name: Salt Flats
Ecological site number: R042XB036NM
Present vegetation: Alkali sacaton, desert seepweed, and fourwing saltbush
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 6 minutes 58.00 seconds
N. and long. 106 degrees 6 minutes 56.50 seconds W.

Az—0 to 6 inches (0 to 15 centimeters); reddish brown (5YR 4/4) silt loam, dark
reddish brown (5YR 3/3) moist; 23 percent clay; moderate thick platy over
moderate medium subangular blocky structure; moderately hard, firm, very sticky, very plastic; few fine dendritic tubular pores; finely disseminated carbonate and gypsum throughout; strongly effervescent, 10 percent calcium carbonate equivalent and 3 percent gypsum; neutral, pH 6.9; electrical conductivity of 22.0 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

Byz1—6 to 30 inches (15 to 76 centimeters); reddish brown (5YR 4/4) gypsiferous silty clay loam, dark reddish brown (5YR 3/4) moist; 28 percent clay; moderate medium subangular blocky structure; slightly hard, friable, very sticky, very plastic; few fine dendritic tubular pores; finely disseminated carbonate and common medium irregular gypsum crystals throughout; strongly effervescent, 9 percent calcium carbonate equivalent and 24 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 23.0 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

Byz2—30 to 50 inches (76 to 127 centimeters); yellowish red (5YR 4/6) gypsiferous silty clay loam, dark reddish brown (5YR 3/4) moist; 31 percent clay; moderate medium subangular blocky structure; slightly hard, friable, very sticky, very plastic; few fine dendritic tubular pores; finely disseminated carbonate and common medium irregular gypsum crystals throughout; strongly effervescent, 11 percent calcium carbonate equivalent and 18 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 20.0 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

Byz3—50 to 60 inches (127 to 152 centimeters); yellowish red (5YR 5/6) clay loam, yellowish red (5YR 4/6) moist; 28 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; finely disseminated carbonate and common medium irregular gypsum crystals throughout; strongly effervescent, 6 percent calcium carbonate equivalent and 14 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 21.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 18 to 35 percent

Az horizon:
   Hue—5YR or 7.5YR
   Value—4 to 5 dry; 3 to 5 moist
   Chroma—3 to 4, dry or moist
   Clay content—18 to 27 percent
   Reaction—neutral or slightly alkaline

Byz horizons:
   Hue—5YR or 7.5YR
   Value—4 to 7 dry; 3 to 6 moist
   Chroma—3 to 6, dry or moist
   Texture—gypsiferous loam, gypsiferous silt loam, gypsiferous silty clay loam, or clay loam
   Clay content—18 to 35 percent
   Reaction—slightly alkaline or moderately alkaline
   Gypsum content—10 to 25 percent

Diagnostic Features

- Ochric epipedon—the zone from 0 to 6 inches (Az horizon)
- Gypsic horizon—the zone from 6 to 60 inches (Byz1, Byz2, and Byz3 horizons)

Description of Riverwash

Riverwash is very deep, excessively drained, stratified material consisting of unstabilized sandy, silty, clayey, and/or gravelly sediment that is part of a dynamic
inter-braided system of bars and channels. This material is not stable and is subject to shifting and sorting. It is usually dry but can be transformed into a temporary water course or a short-lived torrent after large amounts of precipitation or excessive runoff within the watershed. Vegetation is typically not supported due to the constant scouring and shifting of sediments.

52—Matador-Bomber association, 0 to 5 percent slopes

Map Unit Setting

Landform(s): Drainageways (figs. 65 and 66)
Elevation: 3,970 to 4,280 feet (1,211 to 1,305 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Matador and similar soils: 70 percent
Bomber and similar soils: 25 percent
Minor components: 5 percent
Corvus and similar soils
Gypsic Aquialids and similar soils
Matador soils that have a high water table and similar soils
Prelo and similar soils
Rhodes and similar soils
Vertic Haplocambids and similar soils
Yesum and similar soils

Figure 65.—An area of the Matador soil in map unit 52 (Matador-Bomber association, 0 to 5 percent slopes) in the lower piedmont drainageways.
Description of the Matador Soil

*Taxonomic classification*: Coarse-gypseous, hypergypsic, thermic Gypsic Haplosalids  
*Geomorphic position*: Lower drainages and coalescent alluvial fans  
*Parent material*: Gypsiferous alluvium  
*Slope*: 0 to 5 percent  
*Surface cover*  
  Biological crust:  
    - cyanobacteria—0 percent  
    - lichen—0 percent  
    - moss—0 percent  
    - cryptogamic crust—0 percent  
  Chemical crust:  
    - salt—30 percent  
    - gypsum—0 percent  
*Physical cover*:  
  - canopy plant cover—20 percent  
  - woody debris—5 percent  
  - bare soil—60 percent  
  - rock fragments—0 percent  
*Depth to restrictive feature(s)*: 12 to 16 inches to salic horizon  
*Drainage class*: Well drained  
*K_{sat} (solum)*: 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)  
*Available water capacity (total inches)*: 1.6 (very low)  
*Shrink-swell potential*: About 1.5 LEP (low)  
*Flooding hazard*: Occasional  
*Depth to seasonal high water table (minimum)*: About 40 to 60 inches  
*Runoff class*: Very low  
*Hydrologic group*: C

Figure 66.—An area of the Bomber soil in map unit 52 (Matador-Bomber association, 0 to 5 percent slopes) in the upper piedmont drainageways.
Ecological site name: Salt Flats
Ecological site number: R042XB036NM
Present vegetation: Fourwing saltbush, iodinebush, and desert seepweed
Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 67)

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 40.20 seconds N. and long. 106 degrees 7 minutes 31.40 seconds W.
Ayy—0 to 4 inches (0 to 10 centimeters); pale brown (10YR 6/3) gypsiferous sandy loam, yellowish brown (10YR 5/4) moist; 10 percent clay; weak thick platy over weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 65 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 4.0 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 2.0; clear wavy boundary.

Byyz—4 to 15 inches (10 to 38 centimeters); pink (7.5YR 7/3) gypsiferous sandy loam, strong brown (7.5YR 5/6) moist; 14 percent clay; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine, fine, and coarse roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 65 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 28.0 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 37.0; abrupt wavy boundary.

Bnyyz1—15 to 20 inches (38 to 51 centimeters); very pale brown (10YR 8/3) gypsiferous sandy loam, yellowish brown (10YR 5/4) moist; 12 percent clay; moderate medium subangular blocky structure; hard, very firm, nonsticky, nonplastic; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 78 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 40.0 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 44.0; abrupt wavy boundary.

Bnyyz2—20 to 23 inches (51 to 58 centimeters); pink (7.5YR 7/4) gypsiferous loam, brown (7.5YR 5/4) moist; 22 percent clay; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine dendritic tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 4 percent calcium carbonate equivalent and 64 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 74.0 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 60.0; abrupt wavy boundary.

Bnyyz3—23 to 30 inches (58 to 76 centimeters); pink (7.5YR 8/3) gypsiferous loamy sand, light brown (7.5YR 6/4) moist; 4 percent clay; moderate medium subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 76 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 67.0 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 63.0; gradual wavy boundary.

Bnyyz4—30 to 60 inches (76 to 152 centimeters); pink (7.5YR 8/4) gypsiferous sandy loam, strong brown (7.5YR 5/6) moist; 10 percent clay; moderate medium subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 4 percent calcium carbonate equivalent and 60 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 33.0 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 34.0.

Range in Characteristics

Clay content of control section (weighted average): 8 to 22 percent; average of less than 18 percent

Ayy horizon:
Hue—2.5YR, 5YR, 7.5YR, or 10YR
Value—5 to 9 dry; 4 to 8 moist
Chroma—2 to 6, dry or moist
Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous very fine sandy loam
Clay content—8 to 18 percent
Gypsum content—50 to 80 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—slightly saline to strongly saline

**Byyyz and Bnyyyz horizons:**
Hue—5YR, 7.5YR, or 10YR
Value—4 to 9 dry; 3 to 8 moist
Chroma—1 to 6, dry or moist
Texture—gypserous loamy sand, gypsiferous sandy loam, or gypsiferous loam
Clay content—2 to 22 percent
Gypsum content—50 to 90 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 4 inches (Ayy horizon)
- Gypsic horizon—the zone from 4 to 60 inches (Byyyz, Bnyyyz1, Bnyyyz2, Bnyyyz3, and Bnyyyz4 horizons)
- Salic horizon—the zone from 15 to 60 inches (Bnyyyz1, Bnyyyz2, Bnyyyz3, and Bnyyyz4 horizons)

**Description of the Bomber Soil**

*Taxonomic classification:* Fine-gypseous, hypergypsic, thermic Typic Haplogypsids

*Geomorphic position:* Upper drainages

*Parent material:* Clayey alluvium over gypsiferous eolian deposits

*Slope:* 1 to 3 percent

*Surface cover*
  - Biological crust:
    - cyanobacteria—5 percent
    - lichen—0 percent
    - moss—0 percent
    - cryptogamic crust—0 percent
  - Chemical crust:
    - salt—0 percent
    - gypsum—0 percent
  - Physical cover:
    - canopy plant cover—80 percent
    - woody debris—43 percent
    - bare soil—5 percent
    - rock fragments—0 percent

*Drainage class:* Well drained

*K*<sub>sat</sub> (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

*Available water capacity (total inches):* 9.3 (high)

*Shrink-swell potential:* About 6.4 LEP (high)

*Flooding hazard:* Rare

*Runoff class:* Low

*Hydrologic group:* B

*Ecological site name:* Salty Bottomland

*Ecological site number:* R042XB033NM

*Present vegetation:* Alkali sacaton and fourwing saltbush

*Land capability classification (nonirrigated areas):* 7c
Typical Pedon (fig. 68)

Location by Geographic Coordinate System: lat. 32 degrees 56 minutes 7.29 seconds N. and long. 106 degrees 4 minutes 35.09 seconds W.

Ayz—0 to 7 inches (0 to 18 centimeters); brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4) moist; 45 percent clay; moderate medium granular structure; hard, very firm, slightly sticky, slightly plastic; common very fine and many fine roots throughout; finely disseminated carbonate throughout and common fine irregular gypsum masses on faces of peds; violently effervescent, 22 percent calcium carbonate equivalent and 3 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 11.0 dS/m (mmhos/cm); moderately saline; abrupt smooth boundary.

Byyz1—7 to 11.5 inches (18 to 29 centimeters); light gray (10YR 7/2) gypsic loam, brown (10YR 5/3) moist; 22 percent clay; weak medium subangular blocky
structure; slightly hard, friable, nonsticky, nonplastic; many very fine and common
fine roots throughout; common fine dendritic tubular pores; finely disseminated
carbonate and many fine irregular gypsum crystals throughout; strongly
effervescent, 11 percent calcium carbonate equivalent and 86 percent gypsum;
moderately alkaline, pH 7.9; electrical conductivity of 9.0 dS/m (mmhos/cm);
moderately saline; clear smooth boundary.

Byyz2—11.5 to 17.5 inches (29 to 45 centimeters); 10 percent gray (10YR 5/1) and 90
percent very pale brown (10YR 8/2) gypsiferous silt loam, 10 percent dark grayish
brown (10YR 4/2) and 90 percent very pale brown (10YR 7/3) moist; 16 percent
clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky,
nonplastic; common fine roots throughout; common fine dendritic tubular pores;
finely disseminated carbonate and many fine irregular gypsum crystals throughout;
strongly effervescent, 9 percent calcium carbonate equivalent and 67 percent
gypsum; moderately alkaline, pH 8.3; electrical conductivity of 19.0 dS/m (mmhos/cm);
strongly saline; clear smooth boundary.

Byyz3—17.5 to 27.5 inches (45 to 70 centimeters); 40 percent very pale brown (10YR
8/2) and 60 percent gray (2.5Y 6/1) gypsiferous loam, 40 percent light gray
(10YR 7/2) and 60 percent gray (2.5Y 5/1) moist; 16 percent clay; weak medium
subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; common
fine roots throughout; few very fine dendritic tubular pores; finely disseminated
carbonate and many fine irregular gypsum crystals throughout; strongly
effervescent, 11 percent calcium carbonate equivalent and 79 percent gypsum;
strongly alkaline, pH 8.5; electrical conductivity of 17.0 dS/m (mmhos/cm); strongly
saline; clear smooth boundary.

Byyz4—27.5 to 43.5 inches (70 to 110 centimeters); gray (10YR 6/1) gypsiferous
very fine sandy loam, dark grayish brown (10YR 4/2) moist; 12 percent clay;
weak medium subangular blocky structure; moderately hard, firm, nonsticky,
nonplastic; common fine roots throughout; few very fine dendritic tubular pores;
finely disseminated carbonate and many fine irregular gypsum crystals throughout;
violently effervescent, 18 percent calcium carbonate equivalent and 75 percent
gypsum; moderately alkaline, pH 8.3; electrical conductivity of 22.0 dS/m (mmhos/cm);
strongly saline; clear smooth boundary.

Byyz5—43.5 to 60 inches (110 to 152 centimeters); light gray (10YR 7/1) gypsiferous
very fine sandy loam, light brownish gray (10YR 6/2) moist; 10 percent clay;
weak medium subangular blocky structure; moderately hard, firm, nonsticky,
nonplastic; common fine roots throughout; few very fine dendritic tubular pores;
finely disseminated carbonate and many fine irregular gypsum crystals throughout;
strongly effervescent, 7 percent calcium carbonate equivalent and 90 percent
gypsum; moderately alkaline, pH 8.1; electrical conductivity of 17.0 dS/m (mmhos/cm);
strongly saline.

Range in Characteristics

*Clay content of control section (weighted average):* 18 to 24 percent

*Ayz horizon:*

Hue—5YR, 7.5YR, or 10YR
Value—5 to 8 dry; 4 to 7 moist
Chroma—1 to 4, dry or moist
Texture—loam, clay loam, silt loam, silty clay loam, silty clay, or clay
Clay content—15 to 60 percent
Gypsum content—2 to 10 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—moderately saline or strongly saline
Byyz horizons:
- Hue—5YR, 7.5YR, 10YR, or 2.5Y
- Value—5 to 8 dry; 4 to 7 moist
- Chroma—1 to 6, dry or moist
- Texture—gypsiferous loamy sand, gypsiferous sandy loam, gypsiferous fine sandy loam, gypsiferous very fine sandy loam, gypsiferous loam, or gypsiferous silt loam
- Clay content—8 to 27 percent
- Gypsum content—60 to 95 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—moderately saline or strongly saline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (Ayz horizon)
- Gypsic horizon—the zone from 7 to 60 inches (Byyz1, Byyz2, Byyz3, Byyz4, and Byyz5 horizons)

53—Matador family gypsiferous sand, 5 to 90 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts (fig. 69)
Elevation: 3,900 to 4,230 feet (1,190 to 1,288 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days

Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains

Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Matador family and similar soils: 92 percent
Minor components: 8 percent
  - Bigsalt and similar soils
  - Bomber and similar soil
  - Corvus and similar soils
  - Matador and similar soils
  - Najul and similar soils
  - Nasa and similar soils
  - Yesum and similar soils
  - Water

Description of the Matador Family Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Gypsic Haplosalids
Geomorphic position: Steep, eroded risers between drainageways and fan piedmonts and virtually barren, rolling, lacustrine gypsum deposits
Parent material: Gypsiferous eolian deposits
Slope: 5 to 90 percent
Surface cover
  - Biological crust:
    - cyanobacteria—0 percent
    - lichen—0 percent
    - moss—0 percent
    - cryptogamic crust—2 percent
  - Chemical crust:
    - salt—3 percent
    - gypsum—0 percent
  - Physical cover:
    - canopy plant cover—15 percent
    - woody debris—5 percent
    - bare soil—80 percent
    - rock fragments—0 percent
Depth to restrictive feature(s): 2 to 10 inches to salic horizon
Drainage class: Somewhat excessively drained
S sat (solum): 0.57 inch to 1.98 inches per hour (4.00 to 14.00 micrometers per second)
Available water capacity (total inches): 0.5 (very low)
Shrink-swell potential: About 1.4 LEP (low)
Flooding hazard: None
Runoff class: High
Hydrologic group: B
Ecological site name: Gyp Outcrop
Ecological site number: R042XB007NM
Present vegetation: Alkali sacaton, ephedra, fourwing saltbush, and iodinebush
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 55 minutes 9.50 seconds N. and long. 106 degrees 5 minutes 30.68 seconds W.

Ayy1—0 to 2 inches (0 to 5 centimeters); white (10YR 8/1) gypsiferous sand, very pale brown (10YR 8/3) moist; 0 percent clay; moderate medium and coarse
subangular blocky structure; very hard, extremely firm, nonsticky, nonplastic; many fine irregular gypsum crystals throughout; noneffervescent, 79 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.0 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

Ayy2—2 to 7 inches (5 to 18 centimeters); pinkish white (7.5YR 8/2) gypsiferous sand, pink (7.5YR 7/4) moist; 0 percent clay; weak very coarse subangular blocky structure; hard, very firm, nonsticky, nonplastic; many fine irregular gypsum crystals throughout; noneffervescent, 82 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 3.0 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Bnyyz1—7 to 23.5 inches (18 to 60 centimeters); 25 percent brown (7.5YR 5/3) and 75 percent brown (7.5YR 8/2) gypsiferous sandy loam, 25 percent strong brown (7.5YR 4/6) and 75 percent pink (7.5YR 8/3) moist; 12 percent clay; weak coarse subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated salt and carbonate and many fine irregular gypsum crystals throughout; very slightly effervescent, 2 percent calcium carbonate equivalent and 55 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 131.0 dS/m (mmhos/cm); strongly saline; gradual wavy boundary.

Bnyyz2—23.5 to 42 inches (60 to 107 centimeters); 25 percent white (7.5YR 8/1) and 75 percent brown (7.5YR 5/4) gypsiferous sandy loam, 25 percent pink (7.5YR 8/3) and 75 percent brown (7.5YR 4/4) moist; 16 percent clay; weak coarse subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated salt and carbonate and many fine irregular gypsum crystals throughout; very slightly effervescent, 3 percent calcium carbonate equivalent and 55 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 118.0 dS/m (mmhos/cm); strongly saline; clear wavy boundary.

Bnyyz3—42 to 60 inches (107 to 152 centimeters); 10 percent white (7.5YR 8/1) and 90 percent brown (7.5YR 5/4) gypsiferous sandy loam, 10 percent pink (7.5YR 8/3) and 90 percent strong brown (7.5YR 4/6) moist; 16 percent clay; weak coarse subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; finely disseminated salt and carbonate and common fine irregular gypsum crystals throughout; very slightly effervescent, 2 percent calcium carbonate equivalent and 41 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 132.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Note: Matador family soils differ from the Matador series because of slope and landform.

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

Ayy horizons:
- Hue—gley 1, 7.5YR, 10YR, or 2.5Y
- Value—1 to 9.5 dry; 1 to 9 moist
- Chroma—neutral to 6, dry or moist
- Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous sandy clay loam
- Clay content—0 to 35 percent
- Gypsum content—60 to 90 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline to strongly saline

Bnyyz horizons:
- Hue—gley 1, 7.5YR, 10YR, or 2.5Y
Value—1 to 9.5 dry; 1 to 9 moist
Chroma—neutral to 6, dry or moist
Texture—gypsiferous sandy loam, gypsiferous sandy clay loam, gypsiferous loam,
or gypsiferous silt loam
Clay content—10 to 28 percent
Gypsum content—40 to 90 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline to strongly saline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 7 inches (Ayy1 and Ayy2 horizons)
• Gypsic horizon—the zone from 7 to 60 inches (Bnyyz1, Bnyyz2, and Bnyyz3 horizons)
• Salic horizon—the zone from 7 to 60 inches (Bnyyz1, Bnyyz2, and Bnyyz3 horizons)

54—Mcnew-Copia complex, 1 to 15 percent slopes

Map Unit Setting
Landform(s): Basin floors, dunes, and interdunes (fig. 70)
Elevation: 3,920 to 4,280 feet (1,195 to 1,305 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Mcnew and similar soils: 75 percent
Copia and similar soils: 20 percent
Minor components: 5 percent
  Argic Petrocalcids and similar soils
  Patriot and similar soils
  Typic Haplargids and similar soils
  Typic Petrocalcids and similar soils

Description of the Mcnew Soil

**Taxonomic classification:** Fine-loamy, mixed, superactive, thermic Typic Calciargids
**Geomorphic position:** Interdunes on basin floors and thin sand sheets on basin floors
**Parent material:** Alluvium and/or eolian sands over alluvium
**Slope:** 1 to 3 percent

**Surface cover**
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—35 percent
    woody debris—5 percent
    bare soil—70 percent
    rock fragments—0 percent

**Drainage class:** Well drained
**K$_{sat}$ (solum):** 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
**Available water capacity (total inches):** 9.9 (high)
**Shrink-swell potential:** About 4.7 LEP (moderate)
**Flooding hazard:** None
**Runoff class:** Low
**Hydrologic group:** B
**Ecological site name:** Loamy
**Ecological site number:** R042XB014NM
**Present vegetation:** Broom snakeweed and honey mesquite
**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 32 degrees 28 minutes 9.50 seconds N. and long. 106 degrees 15 minutes 34.20 seconds W.

A—0 to 4 inches (0 to 10 centimeters); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; 15 percent clay; moderate medium platy over weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common medium and few fine roots throughout; common medium tubular pores; finely disseminated carbonate throughout; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 2.1 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Btk1—4 to 14 inches (10 to 35 centimeters); light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; 28 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; common medium tubular pores; few faint clay films on all faces of
peds; many medium irregular carbonate masses throughout; violently effervescent, 24 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

Btk2—14 to 23.5 inches (35 to 60 centimeters); light brown (7.5YR 6/4) sandy clay loam, strong brown (7.5YR 5/6) moist; 30 percent clay; moderate medium subangular blocky structure; hard, very firm, moderately sticky, moderately plastic; common medium tubular pores; few faint clay films on all faces of peds; common medium irregular carbonate masses throughout; violently effervescent, 26 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

Btk3—23.5 to 60 inches (60 to 152 centimeters); strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 4/6) moist; 33 percent clay; moderate medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; common medium tubular pores; few faint clay films on all faces of peds; common medium irregular carbonate masses throughout; violently effervescent, 27 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 26 to 32 percent

A horizon:
  Hue—5YR or 7.5YR
  Value—5 to 6 dry; 4 to 5 moist
  Chroma—3 to 6, dry or moist
  Texture—loamy sand or sandy loam
  Clay content—6 to 18 percent
  Calcium carbonate equivalent—5 to 15 percent
  Reaction—slightly alkaline or moderately alkaline

Btk horizons:
  Hue—5YR or 7.5YR
  Value—5 to 8 dry; 4 to 7 moist
  Chroma—3 to 6, dry or moist
  Texture—sandy loam, loam, or sandy clay loam
  Clay content—15 to 35 percent
  Calcium carbonate equivalent—15 to 30 percent
  Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
  • Ochric epipedon—the zone from 0 to 4 inches (A horizon)
  • Argillic horizon—the zone from 4 to 23.5 inches (Btk1 and Btk2 horizons)
  • Calcic horizon—the zone from 4 to 60 inches (Btk1, Btk2, and Btk3 horizons)

Description of the Copia Soil

Taxonomic classification: Mixed, thermic Typic Torripsamments
Geomorphic position: Shrub-coppice dunes on basin floors
Parent material: Eolian sands
Slope: 2 to 15 percent
Surface cover
  Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent

Physical cover:
  canopy plant cover—70 percent
  woody debris—5 percent
  bare soil—35 percent
  rock fragments—0 percent

_Drainage class:_ Excessively drained

\(K_{solf}\) (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

_Available water capacity (total inches):_ 5.4 (moderate)

_Shrink-swelling potential:_ About 0.4 LEP (low)

_Flooding hazard:_ None

_Runoff class:_ Very low

_Hydrologic group:_ A

_Ecological site name:_ Deep Sand

_Ecological site number:_ R042XB011NM

_Present vegetation:_ Honey mesquite and tansy mustard

_Land capability classification (nonirrigated areas):_ 7c

**Typical Pedon**

_Location by Geographic Coordinate System:_ lat. 32 degrees 28 minutes 8.90 seconds N. and long. 106 degrees 15 minutes 34.60 seconds W.

_A—0 to 6 inches (0 to 15 centimeters); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; 5 percent clay; weak thin platy over weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine roots throughout; common medium interstitial pores; noneffervescent; moderately alkaline, pH 7.9; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear wavy boundary._

_C1—6 to 49 inches (15 to 125 centimeters); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; common medium interstitial pores; noneffervescent; moderately alkaline, pH 8.1; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary._

_C2—49 to 60 inches (125 to 152 centimeters); yellowish red (5YR 4/6) loamy fine sand, reddish brown (5YR 4/4) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; common medium interstitial pores; noneffervescent; moderately alkaline, pH 8.2; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline._

**Range in Characteristics**

_Claim content of control section (weighted average):_ 0 to 5 percent

_A horizon:_
  Hue—5YR or 7.5YR
  Value—4 to 5 dry; 3 to 4 moist
  Chroma—4 to 6, dry or moist
  Texture—sand, fine sand, loamy sand, or loamy fine sand
  Clay content—0 to 5 percent

_C horizon:_
  Hue—5YR or 7.5YR
  Value—4 to 5 dry; 3 to 4 moist
  Chroma—4 to 6, dry or moist
Texture—sand, fine sand, loamy sand, or loamy fine sand
Clay content—0 to 5 percent

Diagnostic Features

- Ochric epipedon—the zone from 0 to 6 inches (A horizon)

**55—Mimbres-Rhodes complex, 0 to 3 percent slopes**

**Map Unit Setting**

*Landform(s):* Drainageways (figs. 71 and 72)
*Elevation:* 4,010 to 4,550 feet (1,223 to 1,388 meters)
*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)
*Mean annual air temperature:* 64 to 70 degrees F (18.0 to 21.0 degrees C)
*Mean annual soil temperature:* 66 to 72 degrees F (19.1 to 22.1 degrees C)
*Frost-free period:* 180 to 240 days

*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains
*Land Resource Unit:* 42-2 Chihuahuan Desert Shrub

**Map Unit Composition**

Mimbres and similar soils: 65 percent
Rhodes and similar soils: 30 percent
Minor components: 5 percent
- Aerobee and similar soils
- Aquisalids and similar soils
- Nasa and similar soils

Figure 71.—An area of the Mimbres soil in map unit 55 (Mimbres-Rhodes complex, 0 to 3 percent slopes). This soil typically occurs in the upper piedmont drainageways.
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

Pajarito and similar soils
Shot and similar soils
Yesum and similar soils
Riverwash

Description of the Mimbres Soil

*Taxonomic classification:* Fine-silty, mixed, superactive, thermic Typic Haplocambids

*Geomorphic position:* Fans in the upper piedmont drainages

*Parent material:* Fine-silty alluvium

*Slope:* 0 to 3 percent

*Surface cover:

  Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

  Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

  Physical cover:
  - canopy plant cover—50 percent
  - woody debris—15 percent
  - bare soil—40 percent
  - rock fragments—0 percent

*Drainage class:* Well drained

*K_{sat} (solum):* 0.20 to 0.57 inch per hour (1.40 to 4.00 micrometers per second)

*Available water capacity (total inches):* 10.8 (very high)

*Shrink-swell potential:* About 3.3 LEP (moderate)

*Flooding hazard:* Rare

Figure 72.—An area of the Rhodes soil in map unit 55 (Mimbres-Rhodes complex, 0 to 3 percent slopes). This soil typically occurs in the lower, saline, piedmont drainageways.
Runoff class: Low
Hydrologic group: C
Ecological site name: Draw
Ecological site number: R042XB016NM
Present vegetation: Alkali sacaton, burrograss, fourwing saltbush, and honey mesquite
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 18 minutes 40.40 seconds N. and long. 106 degrees 6 minutes 18.10 seconds W.

A—0 to 6 inches (0 to 15 centimeters); yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 4/4) moist; 25 percent clay; weak fine subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 14 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; diffuse smooth boundary.

Bw1—6 to 25.5 inches (15 to 65 centimeters); light yellowish brown (10YR 6/4) silt loam, brown (10YR 5/3) moist; 26 percent clay; weak fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few medium roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 12 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 1.8 dS/m (mmhos/cm); nonsaline; diffuse smooth boundary.

Bw2—25.5 to 60 inches (65 to 152 centimeters); light yellowish brown (10YR 6/4) silt loam, brown (10YR 5/3) moist; 26 percent clay; weak coarse subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 12 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 20 to 35 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—3 to 6 dry; 2 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—silt loam, sandy clay loam, clay loam, or silty clay loam
- Clay content—20 to 35 percent
- Reaction—slightly alkaline or moderately alkaline

Bw horizons:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—silt loam or silty clay loam
- Clay content—20 to 35 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or moderately saline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
- Cambic horizon—the zone from 6 to 60 inches (Bw1 and Bw2 horizons)
Description of the Rhodes Soil

**Taxonomic classification:** Fine-loamy, gypsic, thermic Gypsic Haplosalids

**Geomorphic position:** Fans in the lower piedmont drainages, above the basin floor

**Parent material:** Alluvium

**Slope:** 0 to 1 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—3 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—35 percent
  - woody debris—25 percent
  - bare soil—50 percent
  - rock fragments—0 percent

**Depth to restrictive feature(s):** 0 to 4 inches to salic horizon

**Drainage class:** Well drained

**$K_{sat}$ (solum):** 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

**Available water capacity (total inches):** 0.6 (very low)

**Shrink-swell potential:** About 2.2 LEP (low)

**Flooding hazard:** Occasional

**Runoff class:** Low

**Hydrologic group:** C

**Ecological site name:** Salt Flats

**Ecological site number:** R042XB036NM

**Present vegetation:** Alkali sacaton, fourwing saltbush, desert seepweed, and honey mesquite

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon** (fig. 73)

**Location by Geographic Coordinate System:** lat. 33 degrees 8 minutes 56.04 seconds N. and long. 106 degrees 16 minutes 24.24 seconds W.

- **Ayz**—0 to 3 inches (0 to 8 centimeters); pinkish gray (7.5YR 6/2) gypsiferous silt loam, brown (7.5YR 4/3) moist; 20 percent clay; weak and moderate thick platy structure; moderately hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; few fine dendritic tubular pores; finely disseminated gypsum and finely disseminated carbonate throughout; strongly effervescent, 7 percent calcium carbonate equivalent and 16 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 26.8 dS/m (mmhos/cm); strongly saline; clear wavy boundary.

- **Bnyz1**—3 to 7.5 inches (8 to 19 centimeters); brown (7.5YR 5/2) gypsiferous silty clay loam, brown (7.5YR 4/2) moist; 30 percent clay; moderate fine and medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; common medium roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and common fine threadlike gypsum masses throughout; strongly effervescent, 6 percent calcium carbonate equivalent and 23 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 56.9 dS/m (mmhos/cm); strongly saline; clear wavy boundary.
Bnyz2—7.5 to 19.5 inches (19 to 50 centimeters); brown (7.5YR 5/4) gypsiferous silt loam, brown (7.5YR 4/3) moist; 25 percent clay; moderate medium and weak coarse subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; few very fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and common fine threadlike gypsum masses throughout; strongly effervescent, 4 percent calcium carbonate equivalent and 24 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 84.7 dS/m (mmhos/cm); strongly saline; gradual wavy boundary.

Figure 73.—Representative profile of the Rhodes soil in map unit 55 (Mimbres-Rhodes complex, 0 to 3 percent slopes). Scale is in centimeters.
2Bnyz—19.5 to 33.5 inches (50 to 85 centimeters); brown (7.5YR 5/4) gypsiferous fine sandy loam, brown (7.5YR 4/4) moist; 17 percent clay; weak coarse and moderate medium subangular blocky structure; moderately hard, firm, nonsticky, moderately plastic; few fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate, common fine irregular gypsum crystal clusters, and common fine threadlike gypsum masses throughout; strongly effervescent, 7 percent calcium carbonate equivalent and 48 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 59.6 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

3Byz—33.5 to 60 inches (85 to 152 centimeters); brown (7.5YR 5/4) gypsiferous sandy clay loam, brown (7.5YR 4/4) moist; 26 percent clay; moderate fine and medium subangular blocky structure; moderately hard, firm, slightly sticky, moderately plastic; few very fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many medium irregular gypsum crystal clusters throughout; strongly effervescent, 7 percent calcium carbonate equivalent and 35 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 24.4 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 18 to 35 percent

Ayz horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—1 to 6, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous loam, gypsiferous silt, gypsiferous silt loam, or gypsiferous silty clay loam
- Clay content—18 to 35 percent
- Gypsum content—15 to 40 percent
- Reaction—slightly alkaline or moderately alkaline

Bnyz horizons:
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 5 dry; 4 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—gypsiferous silt loam or gypsiferous silty clay loam
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline

2Bnyz and 3Byz horizons:
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 8 dry; 3 to 7 moist
- Chroma—2 to 6, dry or moist
- Texture—gypsiferous fine sandy loam, gypsiferous loam, gypsiferous silt loam, gypsiferous sandy clay loam, or gypsiferous silty clay loam
- Clay content—15 to 35 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 3 inches (Ayz horizon)
- Gypsic horizon—the zone from 3 to 60 inches (Bnyz1, Bnyz2, 2Bnyz, and 3Byz horizons)
- Salic horizon—the zone from 3 to 34 inches (Bnyz1, Bnyz2, and 2Bnyz horizons)
56—Mimbres-Chutum-Ybar complex, 0 to 5 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts (fig. 74)  
Elevation: 3,940 to 4,150 feet (1,200 to 1,265 meters)  
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)  
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)  
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)  
Frost-free period: 180 to 240 days  
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains  
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Mimbres and similar soils: 35 percent  
Chutum and similar soils: 25 percent  
Ybar and similar soils: 20 percent  
Minor components: 20 percent  
  Bigsalts and similar soils  
  Fine-gypseous lacustrine deposits  
  Gypsic Haplosalids and similar soils  
  Jato and similar soils  
  Loki and similar soils  
  Najul and similar soils  
  Pajarito and similar soils  
  Riverwash

Description of the Mimbres Soil

Taxonomic classification: Fine-silty, mixed, superactive, thermic Typic Haplocambids
**Geomorphic position:** Middle to upper parts of fan piedmonts and broad drainages  
**Parent material:** Fine-silty alluvium  
**Slope:** 0 to 5 percent  
**Surface cover**  
- Biological crust:  
  - cyanobacteria—0 percent  
  - lichen—0 percent  
  - moss—0 percent  
  - cryptogamic crust—5 percent  
- Chemical crust:  
  - salt—0 percent  
  - gypsum—0 percent  
- Physical cover:  
  - canopy plant cover—40 percent  
  - woody debris—15 percent  
  - bare soil—55 percent  
  - rock fragments—0 percent  

**Drainage class:** Well drained  
**$K_{sat}$ (solum):** 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)  
**Available water capacity (total inches):** 10.2 (very high)  
**Shrink-swell potential:** About 4.1 LEP (moderate)  
**Flooding hazard:** Very rare  
**Runoff class:** Low  
**Hydrologic group:** C  
**Ecological site name:** Bottomland  
**Ecological site number:** R042XB018NM  
**Present vegetation:** Alkali sacaton and honey mesquite  
**Land capability classification (nonirrigated areas):** 7c  

**Typical Pedon**  
**Location by Geographic Coordinate System:** lat. 33 degrees 8 minutes 9.00 seconds  
N. and long. 106 degrees 31 minutes 1.00 second W.  
A—0 to 3 inches (0 to 8 centimeters); gray (10YR 6/1) silt loam, dark brown (10YR 3/3) moist; 23 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine roots throughout; few fine tubular pores; finely disseminated carbonate throughout; strongly effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline; clear wavy boundary.  
Bw—3 to 25 inches (8 to 64 centimeters); reddish yellow (7.5YR 6/6) silty clay loam, dark yellowish brown (10YR 3/4) moist; 28 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, moderately sticky, moderately plastic; few fine roots throughout; common fine tubular pores; finely disseminated carbonate throughout; strongly effervescent, 16 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 1.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.  
Bk1—25 to 42 inches (64 to 107 centimeters); light brown (7.5YR 6/4) silty clay loam, dark yellowish brown (10YR 3/4) moist; 28 percent clay; moderate medium subangular blocky structure; slightly hard, very friable, moderately sticky, moderately plastic; few fine roots throughout; few medium irregular pores; finely disseminated carbonate throughout; strongly effervescent, 21 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 3.2 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.  
Bk2—42 to 60 inches (107 to 152 centimeters); light brown (7.5YR 6/4) silty clay loam, dark yellowish brown (10YR 3/4) moist; 30 percent clay; moderate medium
subangular blocky structure; slightly hard, very friable, moderately sticky, moderately plastic; few fine roots throughout; finely disseminated carbonate throughout; strongly effervescent, 22 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 4.2 dS/m (mmhos/cm); slightly saline.

**Range in Characteristics**

*Clay content of control section (weighted average): 18 to 35 percent*

**A horizon:**
- Hue—7.5YR or 10YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—1 to 4, dry or moist
- Texture—loam, silt loam, or silty clay loam
- Clay content—18 to 30 percent
- Reaction—slightly alkaline or moderately alkaline

**Bw horizon:**
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—loam, silt loam, or silty clay loam
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

**Bk horizons:**
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—silt loam, silty clay loam, or clay loam
- Clay content—18 to 35 percent
- Calcium carbonate equivalent—10 to 25 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline to slightly saline

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 3 to 25 inches (Bw horizon)

**Description of the Chutum Soil**

*Taxonomic classification:* Fine-loamy, mixed, superactive, thermic Typic Haplocalcids

*Geomorphic position:* Higher, more stable areas of fan piedmonts

*Parent material:* Fine-loamy alluvium

*Slope:* 1 to 5 percent

*Surface cover*
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—20 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—45 percent
woody debris—20 percent
bare soil—30 percent
rock fragments—0 percent

Drainage class: Well drained

$K_{sat}$ (solum): 0.57 inch to 1.98 inches per hour (4.00 to 14.00 micrometers per second)

Available water capacity (total inches): 13.1 (very high)

Shrink-swell potential: About 3.2 LEP (moderate)

Flooding hazard: None

Runoff class: Low

Hydrologic group: B

Ecological site name: Limy

Ecological site number: R042XB019NM

Present vegetation: Boxthorn, allthorn, burrograss, and tarbush

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 30 minutes 13.11 seconds N. and long. 106 degrees 23 minutes 32.59 seconds W.

A—0 to 4 inches (0 to 10 centimeters); pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; 23 percent clay; strong very thick platy over moderate medium subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few medium tubular pores; finely disseminated carbonate; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw—4 to 12 inches (10 to 30 centimeters); pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; 25 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few fine and medium roots throughout; few fine tubular pores; finely disseminated carbonate and finely disseminated gypsum; violently effervescent, 19 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 1.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bky1—12 to 27.5 inches (30 to 70 centimeters); pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; 25 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few fine roots throughout; few fine tubular pores; finely disseminated gypsum and common medium irregular carbonate masses throughout; violently effervescent, 22 percent calcium carbonate equivalent and 1 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Bky2—27.5 to 51 inches (70 to 130 centimeters); very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; 20 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; finely disseminated gypsum and common medium irregular carbonate masses throughout; violently effervescent, 38 percent calcium carbonate equivalent and 2 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 2.8 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Bky3—51 to 78.5 inches (130 to 200 centimeters); light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; 21 percent clay; moderate medium subangular blocky structure; extremely hard, friable, moderately sticky, moderately plastic; finely disseminated gypsum and common medium irregular carbonate masses throughout; violently effervescent, 35 percent calcium carbonate equivalent and 1 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 2.2 dS/m (mmhos/cm); very slightly saline.
Range in Characteristics

Clay content of control section (weighted average): 18 to 35 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam or loam
- Clay content—10 to 25 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

Bw horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy clay loam, loam, or silt loam
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

Bky horizons:
- Hue—7.5YR or 10YR
- Value—5 to 8 dry; 4 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy clay loam, loam, or silt loam
- Clay content—18 to 35 percent
- Calcium carbonate equivalent—15 to 40 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 4 to 12 inches (Bw horizon)
- Calcic horizon—the zone from 12 to 79 inches (Bky1, Bky2, and Bky3 horizons)

Description of the Ybar Soil

Taxonomic classification: Fine, mixed, superactive, thermic Typic Calcigypsids
Geomorphic position: Lower toeslopes of fan piedmonts
Parent material: Clayey alluvium
Slope: 1 to 5 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—5 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—50 percent
  - woody debris—25 percent
  - bare soil—40 percent
  - rock fragments—0 percent
Drainage class: Well drained

$K_{sat}$ (solum): 0.06 to 0.57 inch per hour (0.42 micrometer to 4.00 micrometers per second)

Available water capacity (total inches): 13.3 (very high)

Shrink-swell potential: About 3.4 LEP (moderate)

Flooding hazard: Rare

Runoff class: Medium

Hydrologic group: C

Ecological site name: Salt Flats

Ecological site number: R042XB036NM

Present vegetation: Alkali sacaton, fourwing saltbush, and desert seepweed

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 12 minutes 6.80 seconds N. and long. 106 degrees 28 minutes 16.30 seconds W.

An—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/3) moist; 30 percent clay; moderate thick platy over moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, very plastic; common very fine and fine roots throughout; common very fine tubular pores; finely disseminated carbonate throughout; violently effervescent, 27 percent calcium carbonate equivalent and 9 percent gypsum; neutral, pH 7.2; electrical conductivity of 37.0 dS/m (mmhos/cm); strongly saline; gradual wavy boundary.

Bkz—4 to 14 inches (10 to 35 centimeters); brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/3) moist; 30 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, very plastic; common fine, coarse, and very coarse roots throughout; common very fine tubular pores; common fine irregular carbonate masses throughout; violently effervescent, 23 percent calcium carbonate equivalent and 8 percent gypsum; slightly alkaline, pH 7.5; electrical conductivity of 23.0 dS/m (mmhos/cm); strongly saline; diffuse wavy boundary.

Bkyz1—14 to 30 inches (35 to 76 centimeters); brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4) moist; 50 percent clay; moderate medium and coarse subangular blocky structure; hard, firm, moderately sticky, very plastic; common fine roots throughout; common very fine and fine tubular pores; common fine irregular carbonate masses and common fine irregular gypsum crystal clusters throughout; violently effervescent, 35 percent calcium carbonate equivalent and 14 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 15.0 dS/m (mmhos/cm); moderately saline; diffuse wavy boundary.

Bkyz2—30 to 47 inches (76 to 120 centimeters); brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4) moist; 45 percent clay; moderate medium and coarse subangular blocky structure; hard, firm, moderately sticky, very plastic; common very fine and fine tubular pores; common fine irregular carbonate masses and common fine and medium irregular gypsum crystal clusters throughout; violently effervescent, 21 percent calcium carbonate equivalent and 14 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 13.0 dS/m (mmhos/cm); moderately saline; diffuse wavy boundary.

Bkyz3—47 to 75 inches (120 to 190 centimeters); brown (7.5YR 5/4) silty clay, brown (7.5YR 4/3) moist; 42 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, very plastic; few very fine tubular pores; common fine irregular carbonate masses and common fine irregular gypsum crystal clusters throughout; violently effervescent, 18 percent calcium carbonate equivalent and 13 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 13.0 dS/m (mmhos/cm); moderately saline; diffuse wavy boundary.
Bkyz4—75 to 90.5 inches (190 to 230 centimeters); brown (7.5YR 5/4) clay loam, brown (7.5YR 4/3) moist; 37 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky, very plastic; common very fine tubular pores; common fine irregular carbonate masses, common fine irregular gypsum crystal clusters, and common coarse irregular gypsum crystals throughout; violently effervescent, 16 percent calcium carbonate equivalent and 12 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 19.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Note: The Ybar soil in this map unit is considered a taxoadjunct to the series because it has a calcic horizon.

Clay content of control section (weighted average): 35 to 60 percent

An horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—silt loam or silty clay loam
- Clay content—15 to 40 percent
- Reaction—neutral to moderately alkaline
- Salinity—slightly saline to strongly saline

Bkz horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—silt loam, silty clay loam, or clay
- Clay content—18 to 50 percent
- Calcium carbonate equivalent—15 to 25 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—moderately saline or strongly saline

Bkzyz horizons:
- Hue—7.5YR or 10YR
- Value—3 to 5 dry; 4 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—clay loam, silty clay, or clay
- Clay content—35 to 60 percent
- Calcium carbonate equivalent—27 to 40 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—moderately saline or strongly saline

Diagnostic Features

- Ochric epipedon—the zone from 0 to 7 inches (An and Bkz horizons)
- Cambic horizon—the zone from 4 to 14 inches (Bkz horizon)
- Gypsic horizon—the zone from 14 to 90.5 inches (Bkzyz1, Bkzyz2, Bkzyz3, and Bkzyz4 horizons)

57—Nasa-Yesum complex, 0 to 6 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts (fig. 75)
Elevation: 3,960 to 4,820 feet (1,208 to 1,470 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Nasa and similar soils: 50 percent
Yesum and similar soils: 35 percent
Minor components: 15 percent
  Corvus and similar soils
  Gypsic Haplosalids and similar soils
  Hermes and similar soils
  Matador and similar soils
  Peligro and similar soils
  Prelo and similar soils
  Water

Description of the Nasa Soil

Taxonomic classification: Coarse-gypseous, hypergyspic, thermic Typic Petrogypsids
Geomorphic position: Fan piedmonts
Parent material: Gypsiferous eolian deposits
Slope: 0 to 6 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—5 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
Physical cover:
  canopy plant cover—35 percent
  woody debris—7 percent
  bare soil—55 percent
  rock fragments—0 percent

Depth to restrictive feature(s): 26 to 28 inches to petrogypsic horizon

Drainage class: Well drained

$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.01 to 0.42 micrometer per second)

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

Shrink-swell potential: About 1.3 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: C

Ecological site name: Gyp Upland

Ecological site number: R042XB006NM

Present vegetation: Fourwing saltbush, gyp dropseed, honey mesquite, and alkali sacaton

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 56 minutes 54.19 seconds N. and long. 106 degrees 5 minutes 0.23 second W.

Ay—0 to 4.5 inches (0 to 12 centimeters); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; 12 percent clay; moderate medium platy structure; slightly hard, firm, nonsticky, nonplastic; common fine and medium roots throughout; few fine and medium dendritic tubular pores; finely disseminated carbonate and common fine irregular gypsum crystals throughout; strongly effervescent, 5 percent calcium carbonate equivalent and 10 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.0 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

Byyz1—4.5 to 15 inches (12 to 38 centimeters); pinkish white (7.5YR 8/2) gypsiferous fine sandy loam, light brown (7.5YR 6/4) moist; 10 percent clay; moderate fine and medium subangular blocky structure; slightly hard, firm, nonsticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; strongly effervescent, 4 percent calcium carbonate equivalent and 85 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 11.0 dS/m (mmhos/cm); moderately saline; clear wavy boundary.

Byyz2—15 to 27 inches (38 to 69 centimeters); white (7.5YR 8/1) gypsiferous sandy loam, pink (7.5YR 7/4) moist; 14 percent clay; moderate fine and medium subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; few very fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; strongly effervescent, 5 percent calcium carbonate equivalent and 66 percent gypsum; strongly alkaline, pH 8.6; electrical conductivity of 16.0 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

Byyzm—27 to 31.5 inches (69 to 80 centimeters); white (7.5YR 8/1) gypsiferous material, pink (7.5YR 7/4) moist; massive; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 76 percent gypsum; strongly alkaline, pH 8.7; electrical conductivity of 13.0 dS/m (mmhos/cm); moderately saline; clear wavy boundary.

Cyyz—31.5 to 40 inches (80 to 102 centimeters); white (7.5YR 8/1) gypsiferous sandy loam, pink (7.5YR 7/3) moist; 16 percent clay; massive; very hard, extremely

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firm, nonsticky, nonplastic; few fine dendritic tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 72 percent gypsum; strongly alkaline, pH 8.7; electrical conductivity of 16.0 dS/m (mmhos/cm); strongly saline; clear wavy boundary.

2Byyzb1—40 to 54.5 inches (102 to 138 centimeters); 40 percent white (7.5YR 8/1) and 60 percent yellowish red (5YR 4/6) gypsiferous coarse sandy loam, 40 percent pink (5YR 8/3) and 60 percent red (2.5YR 4/6) moist; 13 percent clay; moderate coarse subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; finely disseminated carbonate and many medium irregular gypsum masses throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 41 percent gypsum; strongly alkaline, pH 8.5; electrical conductivity of 15.0 dS/m (mmhos/cm); moderately saline; gradual wavy boundary.

2Byyzb2—54.5 to 60 inches (138 to 152 centimeters); light reddish brown (2.5YR 6/4) gypsiferous loamy coarse sand, red (2.5YR 5/6) moist; 3 percent clay; weak medium and coarse subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; finely disseminated carbonate and common medium irregular gypsum masses throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 44 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 13.0 dS/m (mmhos/cm); moderately saline.

Range in Characteristics

Clay content of control section (weighted average): 8 to 18 percent
Other characteristics: Some pedons do not have a 2Byyzb horizon

Ay horizon:
Hue—7.5YR or 10YR
Value—5 to 6 dry; 4 to 5 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, gypsiferous sandy loam, fine sandy loam, gypsiferous fine sandy loam, loam, or silt loam
Clay content—8 to 18 percent
Gypsum content—5 to 15 percent
Salinity—very slightly saline or slightly saline

Byyz horizons:
Hue—7.5YR or 10YR
Value—7 to 9.5 dry; 6 to 9 moist
Chroma—1 to 6, dry or moist
Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous loam
Clay content—8 to 18 percent
Gypsum content—40 to 100 percent
Reaction—moderately alkaline or strongly alkaline
Salinity—slightly saline to strongly saline
Sodium adsorption ratio—less than 13

Cyyz horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—7 to 9.5 dry; 6 to 9 moist
Chroma—1 to 4, dry or moist
Texture—gypsiferous coarse sandy loam or gypsiferous sandy loam
Clay content—8 to 18 percent
Gypsum content—40 to 100 percent
Reaction—strongly alkaline
Salinity—moderately saline or strongly saline
Sodium adsorption ratio—less than 13

2Bbyzsb horizons:
   Hue—2.5YR, 5YR, or 7.5YR
   Value—4 to 8 dry; 3 to 8 moist
   Chroma—1 to 6, dry or moist
   Texture—gypsiferous loamy coarse sand, gypsiferous loamy sand, gypsiferous
   coarse sandy loam, gypsiferous sandy loam, or gypsiferous fine sandy loam
   Clay content—1 to 18 percent
   Gypsum content—40 to 70 percent
   Reaction—moderately alkaline or strongly alkaline
   Salinity—moderately saline or strongly saline
   Sodium adsorption ratio—less than 13

Byyzm horizon:
   Cemented material—gypsum
   Hardness—very strongly cemented to indurated
   Thickness—3 to 10 inches; laterally discontinuous

Diagnostic Features
- Ochric epipedon—the zone from 0 to 4.5 inches (Ay horizon)
- Gypsic horizon—the zone from 4.5 to 27 inches (Bbyz1 and Byzz2 horizons)
- Petrogypsic horizon—the zone from 27 to 32 inches (Bbyzm horizon)

Description of the Yesum Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: Fan piedmonts
Parent material: Gypsiferous eolian deposits
Slope: 0 to 3 percent
Surface cover
   Biological crust:
      cyanobacteria—0 percent
      lichen—0 percent
      moss—0 percent
      cryptogamic crust—8 percent
   Chemical crust:
      salt—0 percent
      gypsum—0 percent
   Physical cover:
      canopy plant cover—30 percent
      woody debris—5 percent
      bare soil—65 percent
      rock fragments—0 percent

Drainage class: Well drained
$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Available water capacity (total inches): 6.6 (moderate)
Shrink-swell potential: About 1.2 LEP (low)
Flooding hazard: None
Runoff class: Very low
Hydrologic group: B
Ecological site name: Gyp Upland
Ecological site number: R042XB006NM
Present vegetation: Alkali sacaton, fourwing saltbush, and creosote bush
Land capability classification (nonirrigated areas): 7c
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

Typical Pedon (fig. 76)

Location by Geographic Coordinate System: lat. 33 degrees 1 minute 18.45 seconds N. and long. 106 degrees 8 minutes 40.66 seconds W.

Ayy—0 to 1 inch (0 to 3 centimeters); very pale brown (10YR 7/3) gypsiferous very fine sandy loam, brown (7.5YR 5/4) moist; 10 percent clay; weak medium granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 87 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 3.9 dS/m (mmhos/cm); very slightly saline; abrupt smooth boundary.

Byy—1 to 13.5 inches (3 to 34 centimeters); very pale brown (10YR 8/3) gypsiferous sandy loam, light brown (7.5YR 6/4) moist; 13 percent clay; moderate coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate, many fine irregular gypsum crystals, and common fine irregular gypsum masses throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 92 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 5.0 dS/m (mmhos/cm); slightly saline; clear smooth boundary.

Byyz—13.5 to 28.5 inches (34 to 73 centimeters); very pale brown (10YR 8/4) gypsiferous sandy loam, strong brown (7.5YR 5/6) moist; 15 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; finely disseminated carbonate, many fine irregular gypsum crystals, and common fine irregular gypsum masses throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 90 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 9.0 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Figure 76.—Profile of the Yesum soil in map unit 57 (Nasa-Yesum complex, 0 to 6 percent slopes). Scale is in centimeters.
Cyyz—28.5 to 60 inches (73 to 152 centimeters); very pale brown (10YR 7/4) gypsiferous sandy loam, strong brown (7.5YR 5/6) moist; 8 percent clay; massive; moderately hard, firm, nonsticky, nonplastic; few very fine roots throughout; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 85 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 9.0 dS/m (mmhos/cm); moderately saline.

Range in Characteristics

Clay content of control section (weighted average): 10 to 14 percent

Ayy horizon:
- Hue—7.5YR or 10YR
- Value—6 to 7 dry; 4 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, gypsiferous very fine sandy loam, or gypsiferous silt loam
- Clay content—8 to 18 percent
- Gypsum content—70 to 95 percent

Byy horizon:
- Hue—7.5YR or 10YR
- Value—7 to 8 dry; 5 to 7 moist
- Chroma—2 to 4, dry or moist
- Texture—gypsiferous sandy loam or gypsiferous fine sandy loam
- Clay content—8 to 18 percent
- Gypsum content—70 to 95 percent
- Salinity—very slightly saline or slightly saline

Byyz horizon:
- Hue—7.5YR or 10YR
- Value—7 to 8 dry; 5 to 7 moist
- Chroma—4 to 6, dry or moist
- Texture—gypsiferous sandy loam or gypsiferous fine sandy loam
- Clay content—8 to 18 percent
- Gypsum content—70 to 95 percent
- Salinity—slightly saline or moderately saline

Cyyz horizon:
- Hue—7.5YR or 10YR
- Value—7 to 8 dry; 5 to 7 moist
- Chroma—4 to 6, dry or moist
- Texture—gypsiferous sandy loam or gypsiferous fine sandy loam
- Clay content—8 to 18 percent
- Gypsum content—70 to 95 percent
- Salinity—slightly saline or moderately saline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 1 inch (Ayy horizon)
- Gypsic horizon—the zone from 1 to 60 inches (Byy, Byyz, and Cyyz horizons)

58—Noum-Hembrillo association, 0 to 15 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts (fig. 77)
Elevation: 3,940 to 4,270 feet (1,200 to 1,300 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Noum and similar soils: 55 percent
Hembrillo and similar soils: 40 percent
Minor components: 5 percent
  Aerobee and similar soils
  Mimbres and similar soils
  Nasa and similar soils
  Shot and similar soils
  Slickcity and similar soils
  Yesum and similar soils

Description of the Noum Soil

Taxonomic classification: Loamy over coarse-gypseous, mixed over hypergypsic, superactive, thermic Typic Haplogypsids
Geomorphic position: Interdunes and fan piedmonts
Parent material: Eolian sands derived from mixed over gypsiferous eolian deposits
Slope: 0 to 3 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent
Chemical crust:
salt—0 percent
gypsum—0 percent
Physical cover:
canopy plant cover—20 percent
woody debris—2 percent
bare soil—65 percent
rock fragments—25 percent gravel

Drainage class: Somewhat excessively drained

K_{sat} (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

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

Shrink-swell potential: About 1.2 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: B

Ecological site name: Sandy

Ecological site number: R042XB012NM

Present vegetation: Fourwing saltbush and honey mesquite

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 12 minutes 58.50 seconds N. and long. 106 degrees 15 minutes 30.60 seconds W.

A—0 to 2 inches (0 to 5 centimeters); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; noneffervescent; slightly alkaline, pH 7.6; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Bw—2 to 10 inches (5 to 25 centimeters); brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 1 percent gypsum; slightly alkaline, pH 7.5; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

By—10 to 15.5 inches (25 to 40 centimeters); strong brown (7.5YR 5/6) sandy loam, strong brown (7.5YR 4/6) moist; 12 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and common fine irregular gypsum masses throughout; slightly effervescent, 5 percent calcium carbonate equivalent and 13 percent gypsum; slightly alkaline, pH 7.4; electrical conductivity of 1.4 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

2Byy1—15.5 to 35.5 inches (40 to 90 centimeters); pink (7.5YR 7/3) gypsiferous sandy loam, light brown (7.5YR 6/3) moist; 10 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine dendritic tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 6 percent calcium carbonate equivalent and 57 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.
2Byy2—35.5 to 60 inches (90 to 152 centimeters); pinkish gray (7.5YR 6/2) gypsiferous sandy loam, brown (7.5YR 5/2) moist; 10 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 5 percent calcium carbonate equivalent and 48 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.7 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 8 to 18 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—4 to 6, dry or moist
- Texture—sand, fine sand, loamy fine sand, sandy loam, or fine sandy loam
- Clay content—3 to 18 percent
- Reaction—slightly alkaline or moderately alkaline

Bw horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—sand, fine sand, loamy fine sand, sandy loam, or fine sandy loam
- Clay content—3 to 18 percent
- Reaction—slightly alkaline or moderately alkaline

By horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 4 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy loam, fine sandy loam, or very fine sandy loam
- Clay content—8 to 18 percent
- Gypsum content—5 to 15 percent
- Reaction—slightly alkaline or moderately alkaline

2Byy horizons:
- Hue—7.5YR or 10YR
- Value—5 to 8 dry; 4 to 7 moist
- Chroma—2 to 4, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, gypsiferous very fine sandy loam, or gypsiferous loam
- Clay content—8 to 18 percent
- Gypsum content—40 to 80 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features

- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 2 to 10 inches (Bw horizon)
- Gypsic horizon—the zone from 10 to 60 inches (By, 2Byy1, and 2Byy2 horizons)

Description of the Hembrillo Soil

Taxonomic classification: Gypsic, thermic Typic Torripsamments
Geomorphic position: Shrub-coppice dunes
Parent material: Gypsiferous eolian sands
Slope: 0 to 15 percent
Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent
Chemical crust:
salt—0 percent
gypsum—0 percent
Physical cover:
canopy plant cover—50 percent
woody debris—15 percent
bare soil—60 percent
rock fragments—0 percent
Drainage class: Excessively drained
K<sub>sat</sub> (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)
Available water capacity (total inches): 4.2 (low)
Shrink-swell potential: About 0.2 LEP (low)
Flooding hazard: None
Runoff class: Very low
Hydrologic group: A
Ecological site name: Deep Sand
Ecological site number: R042XB011NM
Present vegetation: Fourwing saltbush and honey mesquite
Land capability classification (nonirrigated areas): 7c

Typical Pedon
Location by Geographic Coordinate System: lat. 33 degrees 13 minutes 55.90 seconds N. and long. 106 degrees 14 minutes 27.50 seconds W.

Cy1—0 to 4 inches (0 to 10 centimeters); light brown (7.5YR 6/4) gypsiferous fine sand, brown (7.5YR 5/4) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine interstitial pores; common very fine irregular gypsum crystals throughout; noneffervescent, 16 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 2.2 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Cy2—4 to 14 inches (10 to 35 centimeters); brown (7.5YR 5/4) gypsiferous fine sand, brown (7.5YR 4/4) moist; 3 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine roots throughout; common fine interstitial pores; common very fine irregular gypsum crystals throughout; noneffervescent, 18 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 2.6 dS/m (mmhos/cm); very slightly saline; diffuse wavy boundary.

Cy3—14 to 60 inches (35 to 152 centimeters); strong brown (7.5YR 5/6) gypsiferous fine sand, strong brown (7.5YR 4/6) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium and common fine roots throughout; common fine interstitial pores; common very fine irregular gypsum crystals throughout; noneffervescent, 21 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 2.7 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics
Clay content of control section (weighted average): 0 to 5 percent

Cy horizons:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—3 to 6, dry or moist
Texture—gypsiferous sand, gypsiferous fine sand, or gypsiferous loamy sand
Clay content—0 to 5 percent
Gypsum content—15 to 40 percent

59—Pajarito sandy loam, 0 to 9 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts (fig. 78)
Elevation: 3,940 to 4,690 feet (1,200 to 1,430 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Pajarito and similar soils: 95 percent
Minor components: 5 percent
   Pajarito soils with thin shrub-coppice dune caps
   Riverwash

Description of the Pajarito Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic
Haplocambids
Geomorphic position: Lower positions of alluvial fans and fan piedmonts
Parent material: Coarse-loamy alluvium
Slope: 0 to 9 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—25 percent
    woody debris—5 percent
    bare soil—70 percent
    rock fragments—11 percent gravel

Drainage class: Well drained

$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

Available water capacity (total inches): 7.1 (high)

Shrink-swell potential: About 1.6 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: B

Ecological site name: Sandy

Ecological site number: R042XB012NM

Present vegetation: Creosote bush, honey mesquite, and snakeweed

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 26 minutes 39.00 seconds N. and long. 106 degrees 21 minutes 14.50 seconds W.

A—0 to 8 inches (0 to 20 centimeters); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; 16 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; few fine irregular pores; finely disseminated carbonate throughout; 3 percent gravel; strongly effervescent, 4 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bw1—8 to 21.5 inches (20 to 55 centimeters); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; 15 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots throughout; few fine irregular pores; finely disseminated carbonate throughout; 4 percent gravel; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bw2—21.5 to 60 inches (55 to 152 centimeters); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; 14 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few medium roots throughout; few fine irregular pores; finely disseminated carbonate throughout; 4 percent gravel; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 10 to 17 percent
A horizon:
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 5, dry or moist
- Texture—sandy loam or fine sandy loam
- Clay content—10 to 17 percent
- Rock fragment content—0 to 10 percent
- Reaction—slightly alkaline or moderately alkaline

Bw horizons:
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—sandy loam or fine sandy loam
- Clay content—10 to 17 percent
- Rock fragment content—0 to 10 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
- Ochric horizon—the zone from 0 to 7 inches (A horizon)
- Cambic horizon—the zone from 8 to 60 inches (Bw1 and Bw2 horizons)

60—Pajarito-Adelino-Riverwash complex, 0 to 10 percent slopes

Map Unit Setting

Landform(s): Channels, drainageways, and fan piedmonts
Elevation: 4,590 to 5,580 feet (1,400 to 1,700 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-5 Chihuahuan Desert Hills and Bajadas

Map Unit Composition

Pajarito and similar soils: 45 percent
Adelino and similar soils: 35 percent
Riverwash: 15 percent
Minor components: 5 percent
  Agustin and similar soils
  Stagecoach and similar soils
  Vado and similar soils

Description of the Pajarito Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic Haplocambids
Geomorphic position: Areas between channels in broad drainageways
Parent material: Coarse-loamy alluvium
Slope: 1 to 10 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent
Chemical crust:
salt—0 percent
gypsum—0 percent
Physical cover:
canopy plant cover—40 percent
woody debris—15 percent
bare soil—30 percent
rock fragments—35 percent gravel

Drainage class: Well drained

$K_{sat}$ (solum): 1.98 to 99.92 inches per hour (14.00 to 705.00 micrometers per second)

Available water capacity (total inches): 6.2 (moderate)

Shrink-swell potential: About 1.7 LEP (low)

Flooding hazard: Very rare

Runoff class: Very low

Hydrologic group: A

Ecological site name: Sandy

Ecological site number: R042XB012NM

Present vegetation: Creosote bush

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 39 minutes 57.30 seconds N. and long. 106 degrees 27 minutes 41.90 seconds W.

AC—0 to 7.5 inches (0 to 19 centimeters); brown (7.5YR 5/4) loamy coarse sand, brown (7.5YR 4/3) moist; 5 percent clay; weak medium platy structure parting to single grain; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; many fine interstitial pores; 10 percent gravel; noneffervescent; moderately alkaline, pH 8.0; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bw1—7.5 to 35.5 inches (19 to 90 centimeters); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; 12 percent clay; moderate fine and medium subangular blocky structure; moderately hard, friable, slightly sticky, nonplastic; few medium and common fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate throughout; 5 percent gravel; slightly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

Bw2—35.5 to 60 inches (90 to 152 centimeters); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/3) moist; 17 percent clay; moderate medium subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; few medium roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 2 percent gravel; strongly effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

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

Rock fragment content in control section: 0 to 15 percent

AC horizon:

Hue—7.5YR or 10YR

Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—loamy coarse sand, loamy sand, sandy loam, fine sandy loam, or loam
Clay content—5 to 18 percent

Bw horizons:
Hue—5YR or 7.5YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—8 to 18 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (AC horizon)
- Cambic horizon—the zone from 7.5 to 60 inches (Bw1 and Bw2 horizons)

Description of the Adelino Soil

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Typic Haplocambids
Geomorphic position: Areas between channels in broad drainageways
Parent material: Coarse-loamy alluvium over fine-loamy alluvium
Slope: 0 to 3 percent

Surface cover
Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent
Chemical crust:
- salt—0 percent
- gypsum—0 percent
Physical cover:
- canopy plant cover—35 percent
- woody debris—10 percent
- bare soil—50 percent
- rock fragments—15 percent gravel

Drainage class: Well drained

\( K_{sat} \) (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Available water capacity (total inches): 9.5 (high)
Shrink-swell potential: About 3.7 LEP (moderate)
Flooding hazard: Very rare
Runoff class: Low
Hydrologic group: B
Ecological site name: Loamy
Ecological site number: R042XB014NM
Present vegetation: American tarbush, black grama, and creosote bush
Land capability classification (nonirrigated areas): 7c
alkaline, pH 7.6; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

**Bw1**—4 to 12 inches (10 to 30 centimeters); brown (7.5YR 4/4) sandy loam, dark brown (7.5YR 3/4) moist; 10 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; common medium dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 10 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

**Bw2**—12 to 35.5 inches (30 to 90 centimeters); brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4) moist; 28 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 12 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

**Bw3**—35.5 to 60 inches (90 to 152 centimeters); brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; 25 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium dendritic tubular pores; finely disseminated carbonate throughout; 10 percent gravel; strongly effervescent, 13 percent calcium carbonate equivalent; slightly alkaline, pH 7.5; electrical conductivity of 2.2 dS/m (mmhos/cm); very slightly saline.

### Range in Characteristics

**Clay content of control section (weighted average):** 18 to 30 percent

**A horizon:**
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 2 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—loamy sand, sandy loam, or sandy clay loam
- Clay content—5 to 25 percent
- Reaction—slightly alkaline or moderately alkaline

**Bw horizons:**
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—coarse sandy loam, sandy loam, sandy clay loam, or loam
- Clay content—10 to 30 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline

### Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
- Cambic horizon—the zone from 4 to 60 inches (Bw1, Bw2, and Bw3 horizons)

**Description of Riverwash**

Riverwash is very deep, excessively drained, stratified material consisting of unstabilized sandy, silty, clayey, and/or gravelly sediment that is part of a dynamic inter-braided system of bars and channels. This material is not stable and is subject to shifting and sorting. It is usually dry but can be transformed into a temporary water course or a short-lived torrent after large amounts of precipitation or excessive runoff within the watershed. Vegetation is usually not supported due to the constant scouring and shifting of sediments.
61—Pajarito-Mcnew complex, 1 to 8 percent slopes

Map Unit Setting

Landform(s): Basin floors and sand sheets (fig. 79)
Elevation: 3,900 to 4,300 feet (1,190 to 1,310 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Pajarito and similar soils: 70 percent
Mcnew and similar soils: 20 percent
Minor components: 10 percent
Copia and similar soils
Typic Petrocalcids and similar soils

Description of the Pajarito Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic Haplocambids
Geomorphic position: Thin eolian sand sheets on basin floors
Parent material: Eolian sands
Slope: 2 to 8 percent
Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent
Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—60 percent
- woody debris—10 percent
- bare soil—45 percent
- rock fragments—0 percent

*Drainage class:* Well drained

*Kₜₜ* (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

*Available water capacity (total inches):* 8.2 (high)

*Shrink-swell potential:* About 3.7 LEP (moderate)

*Flooding hazard:* None

*Runoff class:* Very low

*Hydrologic group:* B

*Ecological site name:* Sandy

*Ecological site number:* R042XB012NM

*Present vegetation:* Dropseed, bush muhly, soaptree yucca, and broom snakeweed

*Land capability classification (nonirrigated areas):* 7c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 32 degrees 30 minutes 48.80 seconds N. and long. 106 degrees 9 minutes 20.40 seconds W.

**A—0 to 2 inches (0 to 5 centimeters):** reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; 10 percent clay; moderate medium platy structure; slightly hard, friable, nonsticky, nonplastic; few fine roots throughout; common medium irregular pores; finely disseminated carbonate throughout; strongly effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

**Bw—2 to 10 inches (5 to 25 centimeters):** reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; 15 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine roots throughout; common medium irregular pores; finely disseminated carbonate throughout; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

**Bk1—10 to 33.5 inches (25 to 85 centimeters):** yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; 16 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine irregular pores; common fine irregular carbonate masses throughout; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

**Bk2—33.5 to 49 inches (85 to 125 centimeters):** yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; 21 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; common fine irregular pores; common medium irregular carbonate masses throughout; strongly effervescent, 10 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

**Bk3—49 to 60 inches (125 to 152 centimeters):** light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; 28 percent clay; moderate medium subangular blocky structure; moderately hard, friable, moderately sticky,
moderately plastic; many medium irregular carbonate masses throughout; violently
effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH
8.1; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 8 to 30 percent; average of less
than 18 percent

A horizon:
Hue—5YR or 7.5YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—3 to 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline to slightly saline

Bw and Bk horizons:
Hue—5YR or 7.5YR
Value—5 to 6 dry; 4 to 5 moist
Chroma—4 to 6, dry or moist
Texture—sandy loam, fine sandy loam, or sandy clay loam
Clay content—8 to 30 percent; average of less than 18 percent
Calcium carbonate equivalent—0 to 15 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline to slightly saline

Diagnostic Features

• Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
• Cambic horizon—the zone from 2 to 10 inches (Bw horizon)

Description of the Mcnew Soil

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Typic Calciargids
Geomorphic position: Basin floors
Parent material: Alluvium and/or eolian sands
Slope: 1 to 3 percent
Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent
Chemical crust:
salt—0 percent
gypsum—0 percent
Physical cover:
canopy plant cover—35 percent
woody debris—10 percent
bare soil—75 percent
rock fragments—8 percent gravel
Drainage class: Well drained
K_{sat} (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Available water capacity (total inches): 8.2 (high)
Shrink-swell potential: About 3.0 LEP (moderate)
Flooding hazard: None  
Runoff class: Low  
Hydrologic group: B  
Ecological site name: Loamy  
Ecological site number: R042XB014NM  
Present vegetation: Broom snakeweed, creosote bush, fluffgrass, fourwing saltbush, honey mesquite, sand sagebrush, and soaptree yucca  
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 30 minutes 24.50 seconds N. and long. 106 degrees 10 minutes 57.40 seconds W.

A—0 to 4 inches (0 to 10 centimeters); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; 5 percent clay; weak thin platy over weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; common medium tubular pores; finely disseminated carbonate throughout; strongly effervescent, 8 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Bw—4 to 12 inches (10 to 30 centimeters); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; 10 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common medium and few coarse and fine roots throughout; common medium tubular pores; finely disseminated carbonate throughout; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Btk—12 to 35.5 inches (30 to 90 centimeters); pink (7.5YR 7/3) sandy clay loam, light brown (7.5YR 6/3) moist; 24 percent clay; moderate medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; common fine and medium roots throughout; common medium tubular pores; few faint clay films on all faces of peds; finely disseminated carbonate and common medium and coarse irregular carbonate masses throughout; violently effervescent, 25 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk—35.5 to 60 inches (90 to 152 centimeters); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; 8 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine tubular pores; finely disseminated carbonate throughout; violently effervescent, 8 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 22 to 28 percent  
Other characteristics: Some pedons do not have a cambic (Bw) horizon

A horizon:

Hue—5YR or 7.5YR  
Value—4 to 5 dry; 3 to 4 moist  
Chroma—4 to 6, dry or moist  
Texture—sandy loam or fine sandy loam  
Clay content—5 to 18 percent  
Calcium carbonate equivalent—0 to 10 percent  
Reaction—slightly alkaline to strongly alkaline  
Salinity—nonsaline to slightly saline
**Bw and Bk horizons:**

Hue—5YR or 7.5YR  
Value—5 to 6 dry; 4 to 5 moist  
Chroma—4 to 6, dry or moist  
Texture—sandy loam, fine sandy loam, or sandy clay loam  
Clay content—5 to 30 percent  
Calcium carbonate equivalent—5 to 15 percent  
Reaction—slightly alkaline or moderately alkaline  
Salinity—nonsaline to slightly saline

**Btk horizon:**

Hue—5YR or 7.5YR  
Value—4 to 7 dry; 3 to 6 moist  
Chroma—3 to 6, dry or moist  
Clay content—18 to 30 percent  
Calcium carbonate equivalent—15 to 30 percent  
Reaction—slightly alkaline or moderately alkaline  
Salinity—nonsaline to slightly saline

**Diagnostic Features**

- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)  
- Cambic horizon—the zone from 4 to 12 inches (Bw horizon)  
- Argillic horizon—the zone from 12 to 35.5 inches (Btk horizon)  
- Calcic horizon—the zone from 12 to 35.5 inches (Btk and Bk horizons)

**62—Pantak-Rock outcrop-Lithic Ustic Torriorthents complex, 15 to 70 percent slopes**

**Map Unit Setting**

*Landform(s):* Hills and ridges  
*Elevation:* 4,080 to 7,550 feet (1,244 to 2,300 meters)  
*Mean annual precipitation:* 12 to 14 inches (305 to 356 millimeters)  
*Mean annual air temperature:* 61 to 64 degrees F (16.0 to 18.0 degrees C)  
*Mean annual soil temperature:* 63 to 66 degrees F (17.1 to 19.1 degrees C)  
*Frost-free period:* 180 to 240 days  
*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains  
*Land Resource Unit:* 42-3 Chihuahuan Desert Grassland

**Map Unit Composition**

Pantak and similar soils: 45 percent  
Rock outcrop: 30 percent  
Lithic Ustic Torriorthents and similar soils: 20 percent  
Minor components: 5 percent  
- Queencreek and similar soils  
- Vado and similar soils  
- Riverwash

**Description of the Pantak Soil**

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, thermic Lithic Ustic Haplargids  
*Geomorphic position:* All positions on granitic hills  
*Parent material:* Gravelly residuum weathered from granite  
*Slope:* 15 to 60 percent
Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—55 percent
- woody debris—15 percent
- bare soil—10 percent
- rock fragments—30 percent gravel, 15 percent cobbles, 2 percent stones, and 1 percent boulders

Depth to restrictive feature(s): 12 to 16 inches to lithic bedrock

Drainage class: Well drained

$K_{sat}$ (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

$K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

Available water capacity (total inches): 1.1 (very low)

Shrink-swell potential: About 1.2 LEP (low)

Flooding hazard: None

Runoff class: Very high

Hydrologic group: D

Ecological site name: Gravelly

Ecological site number: R042XC001NM

Present vegetation: Black grama, blue grama, and yucca

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 16 minutes 20.70 seconds N. and long. 106 degrees 32 minutes 2.60 seconds W.

A—0 to 6 inches (0 to 15 centimeters); brown (7.5YR 4/4) very gravelly sandy loam, dark brown (7.5YR 3/4) moist; 16 percent clay; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; many very fine and common fine roots throughout; few very fine and fine dendritic tubular pores; finely disseminated carbonate throughout; 35 percent gravel and 15 percent cobbles; very slightly effervescent, 1 percent calcium carbonate equivalent; neutral, pH 7.2; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bt—6 to 15 inches (15 to 38 centimeters); brown (7.5YR 4/4) extremely gravelly sandy clay loam, dark brown (7.5YR 3/4) moist; 24 percent clay; weak fine subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few very fine and fine roots throughout; few very fine dendritic tubular pores; very few distinct clay films on all faces of peds; 40 percent gravel and 20 percent cobbles; noneffervescent; slightly alkaline, pH 7.4; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

R—15 inches (38 centimeters); slightly weathered, fractured, and very strongly cemented granite.

Range in Characteristics

Clay content of control section (weighted average): 22 to 28 percent

Rock fragment content in control section: 35 to 80 percent
**A horizon:**
- Hue—7.5YR or 10YR
- Value—3 to 5 dry; 2 to 4 moist
- Chroma—1 to 4, dry or moist
- Texture—sandy loam or sandy clay loam
- Clay content—15 to 28 percent
- Rock fragment content—35 to 60 percent
- Reaction—neutral or slightly alkaline

**Bt horizon:**
- Hue—7.5YR or 10YR
- Value—2.5 to 5 dry; 2 to 4 moist
- Chroma—1 to 4, dry or moist
- Clay content—22 to 28 percent
- Rock fragment content—35 to 80 percent
- Reaction—neutral or slightly alkaline

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 6 inches (A horizon)
- Argillic horizon—the zone from 6 to 15 inches (Bt horizon)
- Depth to lithic contact—15 inches (R horizon)

**Description of Rock Outcrop**
This component consists of exposures of steep, flat, or rolling bedrock and cliffs. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

**Description of the Lithic Ustic Torriorthents**

*Taxonomic classification:* Lithic Ustic Torriorthents

*Geomorphic position:* All positions on granitic hills

*Parent material:* Gravelly residuum weathered from granite

*Slope:* 25 to 60 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

**Physical cover**
- canopy plant cover—50 percent
- woody debris—5 percent
- bare soil—20 percent
- rock fragments—15 percent gravel, 40 percent cobbles, 15 percent stones, and 2 percent boulders

**Depth to restrictive feature(s):** 4 to 5 inches to paralithic bedrock; 5 to 15 inches to lithic bedrock

**Drainage class:** Well drained

- $K_{sat}$ (solum): 5.95 to 99.92 inches per hour (42.00 to 705.00 micrometers per second)
- $K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

**Available water capacity (total inches):** 0.2 (very low)

**Shrink-swell potential:** About 0.3 LEP (low)

**Flooding hazard:** None
Runoff class: High
Hydrologic group: D
Ecological site name: Shallow
Ecological site number: R042XC025NM
Present vegetation: Black grama and blue grama
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 31 minutes 3.00 seconds N. and long. 106 degrees 27 minutes 44.30 seconds W.

A—0 to 2 inches (0 to 5 centimeters); dark brown (7.5YR 3/2) gravelly loamy coarse sand, very dark brown (7.5YR 2/2) moist; 5 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; common medium interstitial pores; 25 percent gravel; noneffervescent; neutral, pH 7.0; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

C—2 to 4 inches (5 to 10 centimeters); dark brown (7.5YR 3/2) very gravelly coarse sand, very dark brown (7.5YR 2/2) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common medium interstitial pores; 35 percent gravel and 10 percent cobbles; noneffervescent; neutral, pH 7.1; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Cr—4 to 4.5 inches (10 to 12 centimeters); weathered, fractured, and moderately cemented granite; abrupt smooth boundary.

R—4.5 inches (12 centimeters); slightly weathered, fractured, and very strongly cemented granite.

Range in Characteristics

Note: Lithic Ustic Torriorthents have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 1 to 10 percent
Rock fragment content in control section: 40 to 65 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—3 to 5 dry; 2 to 4 moist
- Chroma—1 to 4, dry or moist
- Texture—coarse sand, sand, loamy coarse sand, or loamy sand
- Clay content—1 to 10 percent
- Rock fragment content—0 to 40 percent
- Reaction—neutral or slightly alkaline

C horizon:
- Hue—7.5YR or 10YR
- Value—3 to 5 dry; 2 to 4 moist
- Chroma—1 to 4, dry or moist
- Texture—coarse sand, coarse sand, sand, loamy coarse sand, or loamy sand
- Clay content—1 to 10 percent
- Rock fragment content—30 to 65 percent
- Reaction—neutral or slightly alkaline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 4 inches (A and C horizons)
- Depth to paralithic contact—4 inches (Cr horizon)
- Depth to lithic contact—5 inches (R horizon)
63—Peligro gypsiferous sandy loam, 0 to 15 percent slopes

Map Unit Setting

Landform(s): Dunes (fig. 80)
Elevation: 3,900 to 4,020 feet (1,190 to 1,225 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Peligro and similar soils: 92 percent
Minor components: 8 percent
  Corvus and similar soils
  Globe and similar soils
  Jato and similar soils
  Loki and similar soils
  Yesum and similar soils

Description of the Peligro Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: All positions of stabilized playa dunes
Parent material: Gypsiferous sandy eolian deposits
Slope: 0 to 15 percent

Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—58 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—14 percent
- Physical cover:
  - canopy plant cover—15 percent
  - woody debris—10 percent
  - bare soil—25 percent
  - rock fragments—0 percent

Drainage class: Excessively drained

\( K_{sat} \) (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

Available water capacity (total inches): 3.2 (low)

Shrink-swell potential: About 1.2 LEP (low)

Flooding hazard: None

Runoff class: Very low

Hydrologic group: A

Ecological site name: Gyp Outcrop

Ecological site number: R042XB007NM

Present vegetation: Gyp dropseed, hairy coldenia, and fourwing saltbush

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 81)

Location by Geographic Coordinate System: lat. 32 degrees 30 minutes 50.40 seconds N. and long. 106 degrees 20 minutes 9.60 seconds W.

Ay—0 to 1 inch (0 to 3 centimeters); light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/3) moist; 14 percent clay; weak thick platy over weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; few fine irregular pores; finely disseminated carbonate and gypsum throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 8 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; very abrupt wavy boundary.

Byy—1 to 9 inches (3 to 23 centimeters); pale orange yellow (10YR 9.5/2) gypsiferous coarse sand, pale orange yellow (10YR 9/2) moist; 2 percent clay; moderate coarse subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; few very fine roots throughout; few fine irregular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 84 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Cyy1—9 to 24.5 inches (23 to 62 centimeters); white (10YR 9/1) gypsiferous coarse sand, white (10YR 8.5/1) moist; 2 percent clay; moderate extremely coarse subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; few very fine roots throughout; many fine interstitial pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; slightly effervescent, 4 percent calcium carbonate equivalent and 78 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 2.9 dS/m (mmhos/cm); very slightly saline; diffuse wavy boundary.
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

Cyy2—24.5 to 36 inches (62 to 91 centimeters); pale orange yellow (10YR 9/2) gypsiferous coarse sand, very pale brown (10YR 8.5/2) moist; 2 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots throughout; many fine interstitial pores; finely disseminated carbonate and many very fine and fine irregular gypsum crystals throughout; slightly effervescent, 4 percent calcium carbonate equivalent and 76 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 2.6 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Cyy3—36 to 62 inches (91 to 158 centimeters); white (10YR 9/1) gypsiferous coarse sand, white (10YR 8.5/1) moist; 2 percent clay; massive; hard, very firm, nonsticky, nonplastic; many fine interstitial pores; finely disseminated carbonate and many

Figure 81.—Representative profile of the Peligro soil in map unit 63 (Peligro gypsiferous sandy loam, 0 to 15 percent slopes). Scale is in centimeters.
very fine irregular gypsum crystals throughout; strongly effervescent, 7 percent calcium carbonate equivalent and 46 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 2.7 dS/m (mmhos/cm); very slightly saline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 2 to 8 percent

**Ay horizon:**
- Hue—7.5YR to 2.5Y
- Value—4 to 8 dry; 3 to 7 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy loam, gypsiferous sandy loam, fine sandy loam, or loam
- Clay content—2 to 15 percent
- Reaction—slightly alkaline or moderately alkaline

**Byy horizon:**
- Hue—10YR or 2.5Y
- Value—7 to 9.5 dry; 6 to 9 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous coarse sand, gypsiferous loamy sand, gypsiferous loamy fine sand, gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous loam
- Clay content—0 to 10 percent
- Reaction—slightly alkaline or moderately alkaline
- Gypsum content—70 to 95 percent

**Cyy horizons:**
- Hue—10YR or 2.5Y
- Value—7 to 9.5 dry; 6 to 9 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous coarse sand, gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous fine sandy loam
- Clay content—0 to 10 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline
- Gypsum content—46 to 95 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 1 inch (Ay horizon)
- Gypsic horizon—the zone from 1 to 9 inches (Byy horizon)

**64—Pena-Pachic Argiustolls-Riverwash complex, 0 to 20 percent slopes**

**Map Unit Setting**

*Landform(s):* Channels and drainageways (fig. 82)
*Elevation:* 5,310 to 6,730 feet (1,620 to 2,050 meters)
*Mean annual precipitation:* 14 to 18 inches (356 to 457 millimeters)
*Mean annual air temperature:* 46 to 50 degrees F (8.0 to 10.0 degrees C)
*Mean annual soil temperature:* 48 to 52 degrees F (9.1 to 11.1 degrees C)
*Frost-free period:* 120 to 180 days
*Major Land Resource Area:* 70C—Central New Mexico Highlands
*Land Resource Unit:* 70C.1 Central New Mexico Highlands
Map Unit Composition

Pena and similar soils: 47 percent
Pachic Argiustolls and similar soils: 35 percent
Riverwash: 15 percent
Minor components: 3 percent
  Aridic Argiustolls and similar soils
  Aridic Haplustolls and similar soils
  Calcidic Argiustolls and similar soils
  Rock outcrop

Description of the Pena Soil

*Taxonomic classification:* Loamy-skeletal, mixed, superactive, mesic Aridic Calciustolls
*Geomorphic position:* Stabilized stream terraces
*Parent material:* Gravelly alluvium derived from sandstone and shale
*Slope:* 0 to 20 percent
*Surface cover*
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent

Figure 82.—An area of map unit 64 (Pena-Pachic Argiustolls-Riverwash complex, 0 to 20 percent slopes).
Physical cover:
- canopy plant cover—52 percent
- woody debris—15 percent
- bare soil—30 percent
- rock fragments—7 percent gravel and 1 percent cobbles

Drainage class: Well drained

$K_{sat}$ (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

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

Shrink-swell potential: About 2.8 LEP (low)

Flooding hazard: Rare

Runoff class: Low

Hydrologic group: A

Ecological site name: Juniperus monosperma-Pinus edulis/Chrysothamnus nauseosus/Bouteloua gracilis-Bouteloua curtipendula

Ecological site number: F070CY125NM

Present vegetation: Black grama, blue grama, cholla, oneseed juniper, pinyon, and sideoats grama

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 47 minutes 55.90 seconds N. and long. 106 degrees 18 minutes 30.90 seconds W.

A—0 to 4.5 inches (0 to 11 centimeters); dark reddish brown (5YR 3/4) loam, dark reddish brown (5YR 3/2) moist; 22 percent clay; weak fine subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; few coarse and common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; clear wavy boundary.

Bk1—4.5 to 20.5 inches (11 to 52 centimeters); reddish brown (5YR 4/4) very gravelly loam, dark reddish brown (5YR 3/3) moist; 19 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few coarse and common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and common fine irregular carbonate masses throughout; 30 percent gravel and 8 percent cobbles; strongly effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; diffuse irregular boundary.

Bk2—20.5 to 60 inches (52 to 152 centimeters); reddish brown (5YR 5/4) extremely gravelly sandy loam, reddish brown (5YR 4/4) moist; 16 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine dendritic tubular pores; finely disseminated carbonate and many fine irregular carbonate masses throughout; 58 percent gravel and 12 percent cobbles; violently effervescent, 25 percent calcium carbonate equivalent; moderately alkaline, pH 8.3.

Range in Characteristics

Clay content of control section (weighted average): 14 to 20 percent

Rock fragment content in control section: 35 to 75 percent

A horizon:
- Hue—5YR or 7.5YR
- Value—4 to 5 dry; 2 to 3 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy loam, fine sandy loam, loam, or sandy clay loam
- Clay content—14 to 25 percent
Rock fragment content—0 to 10 percent
Calcium carbonate equivalent—0 to 10 percent
Reaction—slightly alkaline or moderately alkaline

*Bk* horizons:
- Hue—5YR or 7.5YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam or loam
- Clay content—10 to 20 percent
- Rock fragment content—35 to 75 percent
- Calcium carbonate equivalent—15 to 35 percent
- Reaction—slightly alkaline or moderately alkaline

**Diagnostic Features**
- Mollic epipedon—the zone from 0 to 20.5 inches (A and *Bk*1 horizons)
- Calcic horizon—the zone from 4.5 to 60 inches (Bk1 and Bk2 horizons)

**Description of the Pachic Argiustolls**

*Taxonomic classification:* Fine-loamy, mixed, superactive, mesic Pachic Argiustolls

*Geomorphologic position:* Stabilized stream banks in drainageways

*Parent material:* Fine-loamy alluvium derived from sandstone and shale

*Slope:* 0 to 10 percent

*Surface cover*
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—69 percent
  - woody debris—5 percent
  - bare soil—25 percent
  - rock fragments—9 percent gravel and 1 percent cobbles

*Drainage class:* Well drained

*K*<sub>sat</sub> (*solum*): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

*Available water capacity (total inches):* 11.4 (very high)

*Shrink-swell potential:* About 5.5 LEP (moderate)

*Flooding hazard:* Rare

*Runoff class:* Low

*Hydrologic group:* C

*Ecological site name:* Juniperus monosperma-Pinus edulis/Chrysothamnus nauseosus/Bouteloua gracilis-Bouteloua curtipendula

*Ecological site number:* F070CY125NM

*Present vegetation:* Black grama, blue grama, cholla, oneseed juniper, pinyon, and sideoats grama

*Land capability classification (nonirrigated areas):* 6c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 33 degrees 47 minutes 49.40 seconds N. and long. 106 degrees 18 minutes 23.80 seconds W.
A—0 to 4.5 inches (0 to 12 centimeters); dark brown (7.5YR 3/4) silt loam, dark brown (7.5YR 3/2) moist; 24 percent clay; weak fine subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; few coarse and common fine roots throughout; few fine dendritic tubular pores; 5 percent gravel; slightly effervescent; neutral, pH 6.9; diffuse smooth boundary.

Btk1—4.5 to 23.5 inches (12 to 60 centimeters); dark reddish brown (5YR 3/3) clay loam, dark reddish brown (5YR 3/2) moist; 33 percent clay; moderate medium subangular blocky structure; slightly hard, friable, very sticky, very plastic; common coarse and few fine roots throughout; few fine dendritic tubular pores; very few faint clay films on all faces of peds; common fine irregular carbonate masses throughout; strongly effervescent, 3 percent calcium carbonate equivalent; neutral, pH 7.2; diffuse smooth boundary.

Btk2—23.5 to 60 inches (60 to 152 centimeters); dark reddish brown (5YR 3/3) clay loam, dark reddish brown (5YR 3/2) moist; 36 percent clay; weak coarse subangular blocky structure parting to moderate fine and medium subangular blocky; hard, firm, very sticky, very plastic; few fine roots throughout; few fine dendritic tubular pores; very few faint clay films on all faces of peds; common fine irregular carbonate masses throughout; strongly effervescent, 2 percent calcium carbonate equivalent; neutral, pH 7.2.

Range in Characteristics

Note: Pachic Argiustolls have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 32 to 34 percent
Rock fragment content in control section: 0 to 5 percent
Other characteristics: Some pedons have a Bw horizon above the argillic horizon

A horizon:
- Hue—5YR, 7.5YR, or 10YR
- Chroma—2 to 4, dry or moist
- Texture—loam or silt loam
- Clay content—18 to 26 percent
- Rock fragment content—0 to 5 percent
- Calcium carbonate equivalent—0 to 2 percent
- Reaction—slightly acid or neutral

Btk horizons:
- Hue—5YR or 7.5YR
- Texture—loam, sandy clay loam, or clay loam
- Clay content—20 to 40 percent
- Rock fragment content—0 to 5 percent
- Calcium carbonate equivalent—0 to 4 percent
- Reaction—slightly acid to slightly alkaline

Diagnostic Features
- Mollic epipedon—the zone from 0 to 60 inches (A, Btk1, and Btk2 horizons)
- Argillic horizon—the zone from 4.5 to 60 inches (Btk1 and Btk2 horizons)

Description of Riverwash

Riverwash is very deep, excessively drained, stratified material consisting of unstabilized sandy, silty, clayey, and/or gravelly sediment that is part of a dynamic inter-braided system of bars and channels. This material is not stable and is subject to shifting and sorting. It is usually dry but can be transformed into a temporary water course or a short-lived torrent after large amounts of precipitation or excessive runoff within the watershed. Vegetation is usually not supported due to the constant scouring and shifting of sediments.
65—Pup clay loam, 0 to 9 percent slopes

Map Unit Setting

Landform(s): Alluvial flats (fig. 83)
Elevation: 4,070 to 4,330 feet (1,242 to 1,319 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Pup and similar soils: 90 percent
Minor components: 10 percent
- Marconi and similar soils
- Nasa and similar soils
- Prelo and similar soils
- Yesum and similar soils

Description of the Pup Soil

Taxonomic classification: Fine, mixed, superactive, thermic Chromic Salitorrerts
Geomorphic position: Broad drainageways in alluvial flats
Parent material: Clayey alluvium over gypsiferous eolian deposits
Slope: 0 to 9 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent

Figure 83.—An area of map unit 65 (Pup clay loam, 0 to 9 percent slopes).
moss—0 percent  
cryptogamic crust—5 percent  

Chemical crust:  
salt—0 percent  
gypsum—0 percent  

Physical cover:  
canopy plant cover—50 percent  
woody debris—20 percent  
bare soil—35 percent  
rock fragments—0 percent  

Depth to restrictive feature(s): 0 to 6 inches to salic horizon; 45 to 55 inches to abrupt textural change

Drainage class: Well drained

\[ K_{\text{sat}} \text{ (solum)}: 0.06 \text{ inch to 1.98 inches per hour (0.42 micrometer to 14.00 micrometers per second)} \]

Available water capacity (total inches): 0.8 (very low)

Shrink-swell potential: About 6.5 LEP (high)

Flooding hazard: Very rare

Runoff class: Negligible

Hydrologic group: C

Ecological site name: Salt Flats

Ecological site number: R042XB036NM

Present vegetation: Alkali sacaton, fourwing saltbush, desert seepweed, and honey mesquite

Land capability classification (nonirrigated areas): 7c

**Typical Pedon** (fig. 84)

Location by Geographic Coordinate System: lat. 33 degrees 19 minutes 58.40 seconds N. and long. 106 degrees 19 minutes 27.80 seconds W.

A—0 to 4.5 inches (0 to 11 centimeters); reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; 37 percent clay; weak medium platy over moderate fine granular structure; slightly hard, friable, moderately sticky, moderately plastic; many fine and medium and common very fine roots throughout; common coarse tubular pores; finely disseminated carbonate throughout; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 5.7 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 3.0; clear smooth boundary.

Byz—4.5 to 14 inches (11 to 35 centimeters); dark reddish brown (5YR 3/4) clay, dark reddish brown (5YR 3/3) moist; 42 percent clay; moderate medium subangular blocky structure; very hard, firm, slightly sticky, very plastic; common medium and many very fine roots throughout; few very fine tubular pores; finely disseminated carbonate and common fine irregular gypsum crystal clusters throughout; violently effervescent, 20 percent calcium carbonate equivalent and 2 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 29.8 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 11.0; clear smooth boundary.

Bnssyz1—14 to 23.5 inches (35 to 60 centimeters); reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; 44 percent clay; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, extremely firm, slightly sticky, very plastic; few very fine and medium roots in cracks; common very fine tubular pores; few faint slickensides (pedogenic) on vertical faces of peds; finely disseminated carbonate, few fine irregular gypsum crystals, and common fine threadlike gypsum crystal clusters throughout; strongly effervescent, 15 percent calcium carbonate equivalent and 13 percent gypsum; moderately
alkaline, pH 8.3; electrical conductivity of 35.2 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 34.0; gradual wavy boundary.

Bnssyz2—23.5 to 45.5 inches (60 to 115 centimeters); dark reddish brown (5YR 3/4) clay, dark reddish brown (5YR 3/3) moist; 48 percent clay; moderate medium prismatic structure parting to strong fine and medium angular blocky; extremely
hard, slightly rigid, moderately sticky, very plastic; few very fine and medium roots in cracks; common distinct slickensides (pedogenic) on vertical faces of peds; finely disseminated carbonate, common fine threadlike gypsum crystal clusters, and common fine irregular gypsum crystals throughout; strongly effervescent, 12 percent calcium carbonate equivalent and 5 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 30.6 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 34.0; clear smooth boundary.

Bnssyz3—45.5 to 54.5 inches (115 to 138 centimeters); reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; 42 percent clay; moderate medium prismatic structure parting to moderate medium angular blocky; hard, very firm, moderately sticky, very plastic; common distinct slickensides (pedogenic) on vertical faces of peds; finely disseminated carbonate and many fine threadlike gypsum crystal clusters throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 12 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 24.8 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 32.0; clear smooth boundary.

2Cnyyz—54.5 to 60 inches (138 to 152 centimeters); pink (7.5YR 7/3) gypsiferous loam, light brown (7.5YR 6/3) moist; 12 percent clay; massive; slightly hard, friable, nonsticky, slightly plastic; finely disseminated carbonate, common fine irregular gypsum crystal clusters, and many very fine irregular gypsum crystals throughout; strongly effervescent, 7 percent calcium carbonate equivalent and 63 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 31.5 dS/m (mmhos/cm); strongly saline; sodium adsorption ratio of 33.0.

Range in Characteristics

Clay content of control section (weighted average): 40 to 55 percent

A horizon:
- Hue—2.5YR or 5YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—clay loam, silty clay loam, or clay
- Clay content—35 to 45 percent
- Reaction—moderately alkaline or strongly alkaline
- Salinity—slightly alkaline to strongly saline

Byz horizon:
- Hue—2.5YR or 5YR
- Value—3 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Clay content—40 to 50 percent
- Gypsum content—2 to 25 percent
- Reaction—slightly alkaline to strongly alkaline

Bnssyz horizons:
- Hue—2.5YR or 5YR
- Value—3 to 5 dry; 3 to 4 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy clay or clay
- Clay content—40 to 55 percent
- Gypsum content—5 to 25 percent
- Reaction—slightly alkaline or moderately alkaline

2Cnyyz horizon:
- Hue—7.5YR or 10YR
- Value—7 to 8 dry; 6 to 7 moist
Chroma—3 to 4, dry or moist
Clay content—10 to 15 percent
Gypsum content—40 to 80 percent
Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 4.5 inches (A horizon)
• Gypsic horizon—the zone from 4.5 to 60 inches (Byz, Bnssyz1, Bnssyz2, Bnssyz3, and 2Cnyyz horizons)
• Salic horizon—the zone from 4.5 to 60 inches (Byz, Bnssyz1, Bnssyz2, Bnssyz3, and 2Cnyyz horizons)
• Slickensides—the zone from 14 to 54.5 inches (Bnssyz1, Bnssyz2, and Bnssyz3 horizons)
• Depth to abrupt textural change—54.5 inches

66—Queencreek-Agustin-Stagecoach complex, 0 to 14 percent slopes

Map Unit Setting
Landform(s): Drainageways and fan remnants (fig. 85)
Elevation: 3,900 to 5,610 feet (1,190 to 1,710 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days

Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains

Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Queencreek and similar soils: 35 percent
Agustin and similar soils: 30 percent
Stagecoach and similar soils: 25 percent
Minor components: 10 percent
  Vado and similar soils
  Riverwash

Description of the Queencreek Soil

Taxonomic classification: Sandy-skeletal, mixed, thermic Typic Torrifluvents

Geomorphic position: Drainages on fan remnants

Parent material: Sandy and gravelly alluvium

Slope: 0 to 5 percent

Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—20 percent
    woody debris—15 percent
    bare soil—25 percent
    rock fragments—35 percent gravel and 15 percent cobbles

Drainage class: Excessively drained

$K_{\text{sat}}$ (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)

Available water capacity (total inches): 2.4 (very low)

Shrink-swell potential: About 0.2 LEP (low)

Flooding hazard: Very rare

Runoff class: Negligible

Hydrologic group: A

Ecological site name: Draw

Ecological site number: R042XB016NM

Present vegetation: Threeawn, creosote bush, and desert willow

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 18 minutes 20.00 seconds N. and long. 106 degrees 27 minutes 47.00 seconds W.

C1—0 to 39.5 inches (0 to 100 centimeters); light brown (7.5YR 6/3) very gravelly sand, brown (7.5YR 5/4) moist; 5 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine and fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 35 percent gravel and 15 percent cobbles; slightly effervescent, 3 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear smooth boundary.
C2—39.5 to 63 inches (100 to 160 centimeters); light brown (7.5YR 6/3) extremely gravelly sand, brown (7.5YR 5/4) moist; 5 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine interstitial pores; finely disseminated carbonate throughout; 65 percent gravel; slightly effervescent, 4 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

*Clay content of control section (weighted average):* 1 to 5 percent  
*Rock fragment content in control section:* 35 to 80 percent

*C* horizons:  
- Hue—7.5YR or 10YR  
- Value—5 to 6 dry; 4 to 5 moist  
- Chroma—3 to 4, dry or moist  
- Clay content—1 to 5 percent  
- Rock fragment content—35 to 80 percent  
- Reaction—slightly alkaline or moderately alkaline

Description of the Agustin Soil

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Typic Haplocambids  
*Geomorphic position:* Toeslopes and footslopes of fan remnants  
*Parent material:* Mixed gravelly alluvium  
*Slope:* 3 to 8 percent  
*Surface cover*  
- Biological crust:  
  - cyanobacteria—0 percent  
  - lichen—0 percent  
  - moss—0 percent  
  - cryptogamic crust—0 percent  
- Chemical crust:  
  - salt—0 percent  
  - gypsum—0 percent  
*Physical cover:*  
- canopy plant cover—20 percent  
- woody debris—10 percent  
- bare soil—65 percent  
- rock fragments—10 percent gravel  
*Drainage class:* Somewhat excessively drained  
*K*<sub>sat</sub> (*solum*): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)  
*Available water capacity (total inches):* 5.6 (moderate)  
*Shrink-swell potential:* About 0.9 LEP (low)  
*Flooding hazard:* None  
*Runoff class:* Very low  
*Hydrologic group:* A  
*Ecological site name:* Gravelly  
*Ecological site number:* R042XB010NM  
*Present vegetation:* Honey mesquite, fourwing saltbush, and broom snakeweed  
*Land capability classification (nonirrigated areas):* 7c

Typical Pedon

*Location by Geographic Coordinate System:* lat. 32 degrees 50 minutes 26.70 seconds N. and long. 106 degrees 30 minutes 17.70 seconds W.
A—0 to 4.5 inches (0 to 12 centimeters); brown (10YR 4/3) loamy sand, dark brown (10YR 3/3) moist; 5 percent clay; moderate thin platy over moderate fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; common medium irregular pores; finely disseminated carbonate throughout; 10 percent gravel; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

Bw1—4.5 to 21.5 inches (12 to 55 centimeters); brown (10YR 5/3) sandy loam, dark yellowish brown (10YR 3/4) moist; 10 percent clay; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common fine and medium and few coarse roots throughout; common medium irregular pores; finely disseminated carbonate throughout; 5 percent gravel; strongly effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 1.9 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bw2—21.5 to 31.5 inches (55 to 80 centimeters); brown (10YR 5/3) gravelly sandy loam, brown (10YR 4/3) moist; 8 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; finely disseminated carbonate throughout; 30 percent gravel; strongly effervescent, 14 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Bw3—31.5 to 60 inches (80 to 152 centimeters); pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3) moist; 10 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine roots throughout; finely disseminated carbonate throughout; 20 percent gravel; strongly effervescent, 9 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 2.6 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

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

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—loamy sand or sandy loam
- Clay content—5 to 15 percent
- Rock fragment content—5 to 35 percent

Bw horizons:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Clay content—8 to 18 percent
- Rock fragment content—5 to 35 percent
- Reaction—moderately alkaline or strongly alkaline
- Salinity—nonsaline or very slightly saline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
- Cambic horizon—the zone from 4.5 to 60 inches (Bw1, Bw2, and Bw3 horizons)

Description of the Stagecoach Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Typic Hapl calcids
Geomorphic position: Backslopes, shoulders, and summits of fan remnants

Parent material: Mixed gravelly alluvium

Slope: 3 to 14 percent

Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—25 percent
- woody debris—10 percent
- bare soil—15 percent
- rock fragments—60 percent gravel and 10 percent cobbles

Drainage class: Well drained

\( K_{\text{sat}} \) (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

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

Shrink-swell potential: About 1.1 LEP (low)

Flooding hazard: None

Runoff class: Very low

Hydrologic group: A

Ecological site name: Gravelly

Ecological site number: R042XB010NM

Present vegetation: Creosotebush, honey mesquite, and bush muhly

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 86)

Location by Geographic Coordinate System: lat. 32 degrees 49 minutes 8.30 seconds N. and long. 106 degrees 30 minutes 0.50 second W.

A—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/4) gravelly sandy loam, dark brown (7.5YR 3/4) moist; 8 percent clay; moderate fine granular and weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots throughout; few fine irregular pores; finely disseminated carbonate throughout; 15 percent gravel and 5 percent cobbles; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk1—4 to 15 inches (10 to 38 centimeters); white (7.5YR 8/1) gravelly loamy sand, pinkish gray (7.5YR 7/2) moist; 5 percent clay; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots throughout; few medium irregular pores; common fine and medium irregular carbonate nodules and many coarse irregular carbonate masses throughout; 25 percent gravel; violently effervescent, 23 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk2—15 to 23 inches (38 to 58 centimeters); very pale brown (10YR 8/2) sandy loam, pale brown (10YR 6/3) moist; 12 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots throughout; few fine irregular pores; many coarse irregular carbonate masses throughout; 5 percent gravel; violently effervescent, 17 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline; clear wavy boundary.
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

Bk3—23 to 50.5 inches (58 to 128 centimeters); very pale brown (10YR 7/3) extremely gravelly sandy loam, pale brown (10YR 6/3) moist; 10 percent clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very coarse roots throughout; few fine irregular pores; many coarse irregular carbonate masses throughout; 50 percent gravel, 10 percent cobbles, and 5 percent stones; violently effervescent, 12 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 2.2 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Bk4—50.5 to 62 inches (128 to 158 centimeters); light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; 12 percent clay; moderate medium subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; common medium irregular carbonate masses throughout; 5 percent gravel; strongly effervescent, 7 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 1.8 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 5 to 18 percent  
*Rock fragment content in control section:.* 5 to 80 percent; average of more than 35 percent  
*A horizon:*  
Hue—7.5YR or 10YR  
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—loamy sand or sandy loam
Clay content—5 to 17 percent
Rock fragment content—15 to 60 percent

*Bk horizons:*
Hue—7.5YR or 10YR
Value—5 to 8 dry; 4 to 7 moist
Chroma—1 to 4, dry or moist
Texture—loamy sand or sandy loam
Clay content—5 to 18 percent
Rock fragment content—5 to 80 percent; average of more than 35 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline or very slightly saline

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 4 inches (A horizon)
- Calcic horizon—the zone from 4 to 50.5 inches (Bk1, Bk2, Bk3, and Bk4 horizons)

**67—Queencreek-Riverwash complex, 0 to 5 percent slopes**

**Map Unit Setting**

*Landform(s):* Channels and drainageways (fig. 87)
*Elevation:* 3,940 to 5,250 feet (1,200 to 1,600 meters)
*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)

Figure 87.—An area of map unit 67 (Queencreek-Riverwash complex, 0 to 5 percent slopes).
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Queencreek and similar soils: 50 percent
Riverwash: 40 percent
Minor components: 10 percent
Agustin and similar soils
Delnorte and similar soils
Mimbres and similar soils
Stagecoach and similar soils
Vado and similar soils

Description of the Queencreek Soil

Taxonomic classification: Sandy-skeletal, mixed, thermic Typic Torrifluvents
Geomorphic position: Higher eroded areas within drainageways
Parent material: Sandy and gravelly alluvium
Slope: 0 to 5 percent
Surface cover
Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
  cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—25 percent
  woody debris—5 percent
  bare soil—5 percent
  rock fragments—60 percent gravel, 10 percent cobbles, and 5 percent stones
Drainage class: Excessively drained
K<sub>sat</sub> (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)
Available water capacity (total inches): 1.2 (very low)
Shrink-swell potential: About 0.2 LEP (low)
Flooding hazard: Occasional
Runoff class: Negligible
Hydrologic group: A
Ecological site name: Draw
Ecological site number: R042XB016NM
Present vegetation: Apache plume, desert willow, honey mesquite, and pricklypear
Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 88)

Location by Geographic Coordinate System: lat. 33 degrees 11 minutes 42.30 seconds N. and long. 106 degrees 35 minutes 48.70 seconds W.
C1—0 to 19.5 inches (0 to 49 centimeters); brown (7.5YR 5/4) extremely gravelly sand, brown (7.5YR 4/4) moist; 6 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium roots throughout; many fine interstitial pores;
finely disseminated carbonate throughout; 55 percent gravel and 7 percent cobbles; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

C2—19.5 to 45.5 inches (49 to 115 centimeters); brown (7.5YR 5/3) extremely gravelly sand, brown (7.5YR 4/3) moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; few medium roots throughout; many fine interstitial pores; finely disseminated carbonate throughout; 60 percent gravel and 10 percent cobbles; strongly effervescent, 4 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

C3—45.5 to 60 inches (115 to 152 centimeters); brown (7.5YR 5/3) extremely gravelly sand, brown (7.5YR 5/2) moist; 4 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; finely disseminated carbonate throughout; 60 percent gravel and 3 percent cobbles; slightly effervescent, 3 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 4 to 6 percent
Rock fragment content in control section: 35 to 75 percent

Figure 88.—Profile of the Queencreek soil in map unit 67 (Queencreek-Riverwash complex, 0 to 5 percent slopes).
C horizons:
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 5 moist
- Chroma—2 to 4, dry or moist
- Texture—coarse sand, sand, or loamy sand
- Clay content—0 to 6 percent
- Rock fragment content—35 to 75 percent
- Reaction—slightly alkaline or moderately alkaline

Description of Riverwash

Riverwash is very deep, excessively drained, stratified material consisting of unstabilized sandy, silty, clayey, and/or gravelly sediment that is part of a dynamic inter-braided system of bars and channels. This material is not stable and is subject to shifting and sorting. It is usually dry but can be transformed into a temporary water course or a short-lived torrent after large amounts of precipitation or excessive runoff within the watershed. Vegetation is usually not supported due to the constant scouring and shifting of sediments.

68—Reeves-Ustic Calcigypsids-Double complex, 0 to 20 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts
Elevation: 4,890 to 5,980 feet (1,490 to 1,822 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 61 to 64 degrees F (16.0 to 18.0 degrees C)
Mean annual soil temperature: 63 to 66 degrees F (17.1 to 19.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-3 Chihuahuan Desert Grassland

Map Unit Composition

Reeves and similar soils: 31 percent
Ustic Calcigypsids and similar soils: 30 percent
Double and similar soils: 20 percent
Minor components: 19 percent
- Bissett and similar soils
- Elcor and similar soils
- Riverwash

Description of the Reeves Soil

Taxonomic classification: Fine-loamy, gypsic, thermic Ustic Calcigypsids
Geomorphic position: Drainageways between fan remnants
Parent material: Gypsiferous alluvium
Slope: 0 to 18 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—5 percent
Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
Physical cover:
  - canopy plant cover—40 percent
  - woody debris—10 percent
  - bare soil—35 percent
  - rock fragments—25 percent gravel

Drainage class: Well drained

$K_{sat}$ (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)

Available water capacity (total inches): 10.0 (high)

Shrink-swell potential: About 2.3 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: C

Ecological site name: Gyp Upland

Ecological site number: R042XC006NM

Present vegetation: Gyp dropseed, hairy coldenia, and yucca

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 42 minutes 50.80 seconds N. and long. 106 degrees 7 minutes 3.70 seconds W.

A—0 to 3.5 inches (0 to 9 centimeters); pink (7.5YR 7/3) sandy clay loam, light brown (7.5YR 6/4) moist; 22 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and common fine roots throughout; many very fine and few fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent gravel; violently effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 2.1 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Bky1—3.5 to 15 inches (9 to 38 centimeters); light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; 25 percent clay; weak fine and medium subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; common very fine and few fine roots throughout; few very fine and fine dendritic tubular pores; finely disseminated carbonate and gypsum throughout; violently effervescent, 15 percent calcium carbonate equivalent and 7 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 2.0 dS/m (mmhos/cm); very slightly saline; abrupt smooth boundary.

Bky2—15 to 21.5 inches (38 to 55 centimeters); light brown (7.5YR 6/4) gypsiferous loam, brown (7.5YR 5/4) moist; 22 percent clay; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine dendritic tubular pores; finely disseminated carbonate and gypsum throughout; strongly effervescent, 5 percent calcium carbonate equivalent and 35 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Bky3—21.5 to 60 inches (55 to 152 centimeters); strong brown (7.5YR 5/6) gypsiferous sandy clay loam, strong brown (7.5YR 4/6) moist; 25 percent clay; moderate fine and medium subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; few fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate and gypsum throughout; strongly effervescent, 5 percent calcium carbonate equivalent and 39 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 3.3 dS/m (mmhos/cm); very slightly saline.
Range in Characteristics

Note: The Reeves soil in this survey area is considered a taxadjunct to the series.

Clay content of control section (weighted average): 18 to 27 percent

A horizon:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, loam, or sandy clay loam
Clay content—18 to 27 percent

Bky horizons:
Hue—7.5YR or 10YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—2 to 6, dry or moist
Texture—sandy loam, fine sandy loam, loam, gypsisferous loam, sandy clay
loam, gypsisferous sandy loam, gypsisferous sandy clay loam, or gypsisferous
clay loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—5 to 25 percent
Gypsum content—5 to 40 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline or slightly saline

Diagnostic Features

- Ochric epipedon—the zone from 0 to 3.5 inches (A horizon)
- Calcic horizon—the zone from 3.5 to 15 inches (Bky1 horizon)
- Gypsic horizon—the zone from 15 to 60 inches (Bky1, Bky2, and Bky3 horizons)

Description of the Ustic Calcigypsids

Taxonomic classification: Ustic Calcigypsids
Geomorphic position: Fan remnants
Parent material: Gypsisferous gravelly alluvium
Slope: 0 to 20 percent
Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—5 percent
Chemical crust:
salt—0 percent
gypsum—0 percent
Physical cover:
canopy plant cover—35 percent
woody debris—5 percent
bare soil—30 percent
rock fragments—35 percent gravel and 5 percent cobbles
Drainage class: Somewhat excessively drained
K_{sat} (solum): 0.20 inch to 19.98 inches per hour (1.40 to 141.00 micrometers per second)
Available water capacity (total inches): 4.3 (low)
Shrink-swell potential: About 1.9 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: C
Ecological site name: Gyp Upland
Ecological site number: R042XC006NM
Present vegetation: Dogweed, gyp dropseed, and yucca
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 42 minutes 56.90 seconds N. and long. 106 degrees 7 minutes 11.00 seconds W.

A—0 to 1 inch (0 to 2 centimeters); light brown (7.5YR 6/4) gravelly loam, brown (7.5YR 5/4) moist; 20 percent clay; moderate thin platy structure; soft, very friable, slightly sticky, slightly plastic; few very fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate throughout; 10 percent gravel and 6 percent cobbles; violently effervescent; 15 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 2.1 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Bky1—1 to 4 inches (2 to 10 centimeters); pink (7.5YR 7/3) gypsiferous very gravelly loam, light brown (7.5YR 6/4) moist; 22 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common medium and few very fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate, common fine irregular carbonate masses, and common coarse irregular gypsum masses throughout; 35 percent gravel and 6 percent cobbles; violently effervescent; 13 percent calcium carbonate equivalent and 32 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 2.4 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Bky2—4 to 60 inches (10 to 152 centimeters); light brown (7.5YR 6/4) gypsiferous very gravelly sandy loam, brown (7.5YR 5/4) moist; 12 percent clay; moderate fine subangular blocky structure; moderately hard, friable, slightly sticky, slightly plastic; common fine and medium roots throughout; many very fine interstitial pores; finely disseminated carbonate and common fine and medium irregular gypsum crystal clusters throughout; 50 percent gravel and 5 percent cobbles; violently effervescent; 20 percent calcium carbonate equivalent and 27 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Note: Ustic Calcigypsids have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 12 to 22 percent
Rock fragment content in control section: 15 to 65 percent

A horizon:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, loam, or sandy clay loam
Clay content—18 to 27 percent

Bky horizons:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam or loam

323
Clay content—12 to 27 percent
Rock fragment content—15 to 65 percent
Calcium carbonate equivalent—5 to 40 percent; average of more than 15 percent
Gypsum content—15 to 40 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 1 inch (A horizon)
- Calcic horizon—the zone from 1 to 60 inches (Bky1 and Bky2 horizons)
- Gypsic horizon—the zone from 1 to 60 inches (Bky1 and Bky2 horizons)

Description of the Double Soil

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Ustic Haplocambids
Geomorphic position: Drainageways between fan remnants and the lower, more recent alluvial fans
Parent material: Fine-loamy alluvium
Slope: 0 to 5 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—65 percent
  - woody debris—15 percent
  - bare soil—40 percent
  - rock fragments—0 percent

Drainage class: Well drained
$K_{sat}$ (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)
Available water capacity (total inches): 9.6 (high)
Shrink-swell potential: About 3.3 LEP (moderate)
Flooding hazard: None
Runoff class: Low
Hydrologic group: C
Ecological site name: Loamy
Ecological site number: R042XC007NM
Present vegetation: Black grama and cholla
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 42 minutes 39.00 seconds N. and long. 106 degrees 6 minutes 18.20 seconds W.

A—0 to 1.5 inches (0 to 4 centimeters); brown (7.5YR 5/3) loam, dark brown (7.5YR 3/3) moist; 22 percent clay; weak thin platy structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots throughout; many very fine vesicular pores; finely disseminated carbonate throughout; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.3 ds/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw—1.5 to 47 inches (4 to 120 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 25 percent clay; moderate fine and medium subangular blocky structure; soft, very friable, moderately sticky, moderately plastic; few very fine
roots throughout; common fine dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

BC—47 to 60 inches (120 to 152 centimeters); light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; 20 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; many very fine vesicular pores; finely disseminated carbonate throughout; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 18 to 25 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy clay loam, loam, or silt loam
- Clay content—18 to 27 percent

Bw horizon:
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy clay loam, loam, or silt loam
- Clay content—18 to 27 percent

BC horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy clay loam, loam, or silt loam
- Clay content—18 to 27 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 1.5 to 47 inches (Bw horizon)

69—Rioperdido-Harses association, 0 to 4 percent slopes

Map Unit Setting

Landform(s): Drainageways (fig. 89)
Elevation: 3,980 to 4,040 feet (1,214 to 1,231 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Rioperdido and similar soils: 55 percent
Harses and similar soils: 40 percent
Minor components: 5 percent
   Astrobee and similar soils
   Lark and similar soils
   Transformer and similar soils
   Oxyaquic Torrifluvents with a fine-silty or coarse-silty particle-size class and similar soils
   Duneland
   Water

**Description of the Rioperdido Soil**

*Taxonomic classification:* Coarse-gypseous, hypergypsic, thermic Oxyaquic Torrifluvents

*Geomorphic position:* Lower portions of the intermittent Lost River

*Parent material:* Silty alluvium over gypsiferous eolian sands

*Slope:* 0 to 3 percent

*Surface cover*
   Biological crust:
   - cyanobacteria—0 percent
   - lichen—0 percent
   - moss—0 percent
   - cryptogamic crust—0 percent

Chemical crust:
   - salt—0 percent
   - gypsum—0 percent

Physical cover:
   - canopy plant cover—95 percent

Figure 89.—An area of map unit 69 (Rioperdido-Harses association, 0 to 4 percent slopes).
woody debris—15 percent
bare soil—5 percent
rock fragments—0 percent

**Drainage class:** Poorly drained

**\( K_{\text{sat}} \) (solum):** 0.20 inch to 19.98 inches per hour (1.40 to 141.00 micrometers per second)

**Available water capacity (total inches):** 4.7 (low)

**Shrink-swell potential:** About 2.6 LEP (low)

**Flooding hazard:** Occasional

**Ponding hazard:** Occasional

**Depth to seasonal high water table (minimum):** About 0 to 20 inches

**Runoff class:** Negligible

**Hydrologic group:** C/D

**Ecological site name:** Salt Meadow

**Ecological site number:** R042XB028NM

**Present vegetation:** Inland saltgrass, iodinebush, and saltcedar

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 32 degrees 52 minutes 47.80 seconds N. and long. 106 degrees 10 minutes 28.10 seconds W.

**Ayz**—0 to 4.5 inches (0 to 12 centimeters); pinkish gray (5YR 6/2) silty clay loam, reddish brown (2.5YR 4/3) moist; 32 percent clay; moderate medium subangular blocky structure; slightly hard, friable, very sticky, very plastic; many fine roots throughout; common fine dendritic tubular pores; finely disseminated gypsum, carbonate, and salt throughout; strongly effervescent, 17 percent calcium carbonate equivalent and 13 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 16.6 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

**Cyyz1**—4.5 to 14 inches (12 to 35 centimeters); pinkish gray (5YR 7/2) gypsiferous sandy loam, reddish brown (5YR 4/4) moist; 12 percent clay; massive; soft, very friable, slightly sticky, slightly plastic; common fine roots throughout; few fine dendritic tubular pores; finely disseminated gypsum, carbonate, and salt throughout; strongly effervescent, 6 percent calcium carbonate equivalent and 71 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 13.6 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

**Cyyz2**—14 to 60 inches (35 to 152 centimeters); white (10YR 8/1) gypsiferous sand, gray (10YR 6/1) moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; common fine roots throughout; many fine interstitial pores; finely disseminated gypsum, salt, and carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 71 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 9.2 dS/m (mmhos/cm); moderately saline.

**Range in Characteristics**

**Clay content of control section (weighted average):** 2 to 18 percent

**Ayz horizon:**

- **Hue:** 2.5YR, 5YR, or 7.5YR
- **Value:** 4 to 6 dry; 3 to 5 moist
- **Chroma:** 2 to 4, dry or moist
- **Texture:** silt loam or silty clay loam
- **Clay content:** 20 to 36 percent
Calcium carbonate equivalent—0 to 20 percent
Gypsum content—5 to 35 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—moderately saline or strongly saline

*Cyyz* horizons:
- Hue—5YR, 7.5YR, 10YR, or neutral
- Value—4 to 8 dry; 3 to 7 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous silt loam
- Clay content—2 to 18 percent
- Calcium carbonate equivalent—0 to 10 percent
- Gypsum content—40 to 95 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—moderately saline or strongly saline

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 4.5 inches (*Ayz* horizon)
- Endosaturation—the zone from 0 to 60 inches
- Episaturation—the zone from 0 to 20 inches

**Description of the Harses Soil**

*Taxonomic classification:* Hypergypsic, thermic Typic Torripsamments

*Geomorphic position:* The Lost River terminus

*Parent material:* Gypsiferous eolian sands

*Slope:* 0 to 4 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—60 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—20 percent
  - woody debris—20 percent
  - bare soil—10 percent
  - rock fragments—0 percent

**Drainage class:** Excessively drained

*K_{sat} (solum):* 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

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

*Shrink-swell potential:* About 0.6 LEP (low)

*Flooding hazard:* Very rare

*Ponding hazard:* Rare

*Runoff class:* Negligible

*Hydrologic group:* A

*Ecological site name:* Gyp Playa Step (Deep)

*Ecological site number:* R042XB030NM

*Present vegetation:* Alkali sacaton, broom snakeweed, gyp grama, saltcedar, and skunkbush sumac

*Land capability classification (nonirrigated areas):* 7c
Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 51 minutes 52.70 seconds N. and long. 106 degrees 12 minutes 15.40 seconds W.

Cyy1—0 to 30.5 inches (0 to 77 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 2 percent clay; single grain; loose, loose, nonsticky, nonplastic; common fine roots throughout; many fine interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent and 80 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 6.8 dS/m (mmhos/cm); slightly saline; gradual smooth boundary.

Cyy2—30.5 to 60 inches (77 to 152 centimeters); pink (7.5YR 8/3) gypsiferous sand, pink (7.5YR 7/4) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; finely disseminated gypsum and carbonate throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 80 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 6.2 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 8 percent

Cyy horizons:
- Hue—5YR, 7.5YR, 10YR, or 2.5Y
- Value—7 to 9.5 dry; 6 to 9 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sand, gypsiferous loamy sand, or gypsiferous loamy fine sand
- Clay content—0 to 8 percent
- Calcium carbonate equivalent—0 to 2 percent
- Gypsum content—40 to 95 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—slightly saline or moderately saline

70—Rubble land-Rock outcrop-Far complex, 3 to 90 percent slopes

Map Unit Setting

Landform(s): Escarpments, mountains, and talus slopes (fig. 90)
Elevation: 6,980 to 8,960 feet (2,128 to 2,731 meters)
Mean annual precipitation: 18 to 22 inches (457 to 560 millimeters)
Mean annual air temperature: 45 to 48 degrees F (7.0 to 9.0 degrees C)
Mean annual soil temperature: 47 to 50 degrees F (8.1 to 10.1 degrees C)
Frost-free period: 120 to 180 days
Major Land Resource Area: 70C—Central New Mexico Highlands
Land Resource Unit: 70C.1 Central New Mexico Highlands

Map Unit Composition

Rubble land: 50 percent
Rock outcrop: 30 percent
Far and similar soils: 20 percent
Description of Rubble Land

This component consists of exposures on steep talus slopes. Areas are typically barren but may have sparse vegetation growing between rock fragments or in thin layers of eolian, alluvial, or colluvial material. This material is not stable and is subject to shifting and sorting.

Description of Rock Outcrop

This component consists of exposures of steep, flat, or rolling bedrock and cliffs. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

Description of the Far Soil

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

*Geomorphic position:* Mountaintops and side slopes

*Parent material:* Colluvium derived from rhyolite and/or residuum weathered from rhyolite

*Slope:* 3 to 40 percent

*Surface cover*

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—75 percent
  - woody debris—20 percent
  - bare soil—2 percent
  - rock fragments—18 percent gravel, 5 percent cobbles, and 1 percent stones

*Depth to restrictive feature(s):* 2 to 8 inches to lithic bedrock
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

Drainage class: Well drained

$K_{sat}$ (solum): 5.95 to 19.98 inches per hour (42.00 to 141.00 micrometers per second)

$K_{sat}$ (restrictive layer): 0.01 inch to 19.98 inches per hour (0.07 micrometer to 141.00 micrometers per second)

Available water capacity (total inches): 0.2 (very low)

Shrink-swell potential: About 0.7 LEP (low)

Flooding hazard: None

Runoff class: High

Hydrologic group: D

Ecological site name: Juniperus monosperma-Pinus edulis/Chrysothamnus nauseosus/Bouteloua gracilis-Bouteloua curtipendula

Ecological site number: F070CY125NM

Present vegetation: Blue grama and ponderosa pine

Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 17 minutes 50.10 seconds N. and long. 106 degrees 31 minutes 59.60 seconds W.

A—0 to 3 inches (0 to 8 centimeters); very dark gray (7.5YR 3/1) very gravelly fine sandy loam, black (7.5YR 2.5/1) moist; 14 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; few fine irregular pores; 43 percent gravel and 8 percent cobbles; noneffervescent; slightly acid, pH 6.4; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear irregular boundary.

R—3 inches (8 centimeters); unweathered, fractured, and indurated rhyolite.

Range in Characteristics

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

Other characteristics: Some pedons have a thin Cr horizon

A horizon:

Hue—7.5YR or 10YR

Value—3 to 4 dry; 2 to 3 moist

Chroma—1 to 3, dry or moist

Texture—sandy loam, fine sandy loam, or loam

Clay content—14 to 18 percent

Rock fragment content—35 to 55 percent

Diagnostic Features

- Mollic epipedon—the zone from 0 to 3 inches (A horizon)
- Depth to lithic contact—3 inches (R horizon)

71—Salago-Llano complex, 0 to 2 percent slopes

Map Unit Setting

Landform(s): Playa steps and playas (fig. 91)

Elevation: 3,890 to 3,910 feet (1,187 to 1,192 meters)

Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)

Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)

Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)

Frost-free period: 180 to 240 days

Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains

Land Resource Unit: 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Salago and similar soils: 55 percent
Llano and similar soils: 35 percent
Minor components: 10 percent
  Oxyaquic Torriorthents and similar soils
  Transformer and similar soils
  Typic Haplosalids and similar soils
  Typic Petrogypsids and similar soils

Description of the Salago Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Typic Aquisalids
Geomorphic position: Playas
Parent material: Gypsiferous lacustrine deposits
Slope: 0 to 2 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—5 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—0 percent
    woody debris—0 percent
    bare soil—95 percent
    rock fragments—0 percent

Figure 91.—An area of map unit 71 (Salago-Llano complex, 0 to 2 percent slopes).
Depth to restrictive feature(s): 0 inches to salic horizon

Drainage class: Somewhat poorly drained

$K_{sat}$ (solum): 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity (total inches): 0.0 (very low)

Shrink-swell potential: About 1.4 LEP (low)

Flooding hazard: None

Ponding hazard: Rare

Depth to seasonal high water table (minimum): About 20 to 39 inches

Runoff class: Negligible

Hydrologic group: C

Ecological site name: Gyp Playa

Ecological site number: R042XB008NM

Present vegetation: None

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 47 minutes 28.50 seconds N. and long. 106 degrees 23 minutes 35.80 seconds W.

Cnnyzy1—0 to 2.5 inches (0 to 6 centimeters); pale yellow (2.5Y 7/3) gypsiferous sandy clay loam, light yellowish brown (2.5Y 6/4) moist; 20 percent clay; massive; soft, very friable, nonsticky, nonplastic; common very fine dendritic tubular pores; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 60 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 60.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cnnyzy2—2.5 to 16.5 inches (6 to 42 centimeters); light gray (2.5Y 7/2) gypsiferous sandy loam, light brownish gray (2.5Y 6/2) moist; 9 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 74 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 41.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cnnyzyg—16.5 to 60 inches (42 to 152 centimeters); gray (N 5/0) gypsiferous sandy loam, dark gray (N 4/0) moist; 16 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 62 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 55.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 18 percent

Cnnyzy horizons:

Hue—10YR or 2.5Y

Value—5 to 7 dry; 4 to 6 moist

Chroma—2 to 4, dry or moist

Texture—gypsiferous sand, gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous sandy clay loam

Clay content—0 to 27 percent

Gypsum content—40 to 80 percent

Reaction—slightly alkaline or moderately alkaline

Cnnyzyg horizon:

Hue—neutral or 10Y

Value—5 to 7 dry; 4 to 6 moist
Texture—gypsiferous sand, gypsiferous loamy sand, or gypsiferous sandy loam
Clay content—0 to 18 percent
Rock fragment content—0 to 25 percent
Gypsum content—40 to 80 percent
Reaction—slightly alkaline or moderately alkaline

**Diagnostic Features**
- Salic horizon—the zone from 0 to 60 inches (Cnyyz1, Cnyyz2, and Cnyyzg horizons)
- Endosaturation—the zone from 36 to 60 inches

**Description of the Llano Soil**

*Taxonomic classification:* Coarse-gypseous, hypergypsic, thermic Petrogypsic Haplosalids

*Geomorphic position:* Playa steps

*Parent material:* Gypsiferous lacustrine deposits

*Slope:* 0 to 2 percent

*Surface cover*
- **Biological crust:**
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- **Chemical crust:**
  - salt—5 percent
  - gypsum—0 percent
- **Physical cover:**
  - canopy plant cover—0 percent
  - woody debris—0 percent
  - bare soil—95 percent
  - rock fragments—0 percent

*Depth to restrictive feature(s):* 0 to 4 inches to salic horizon; 10 to 17.5 inches to petrogypsic horizon

*Drainage class:* Well drained

*K*$_{sat}$ (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*K*$_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

*Available water capacity (total inches):* 0.0 (very low)

*Shrink-swell potential:* About 0.9 LEP (low)

*Flooding hazard:* None

*Ponding hazard:* Rare

*Runoff class:* Negligible

*Hydrologic group:* D

*Ecological site name:* Alkali Flat

*Ecological site number:* R042XB001NM

*Present vegetation:* None

*Land capability classification (nonirrigated areas):* 7c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 32 degrees 51 minutes 3.90 seconds N. and long. 106 degrees 24 minutes 57.70 seconds W.

*Ayyz—0 to 1 inch (0 to 2 centimeters); white (10YR 8/1) gypsiferous sand, very pale brown (10YR 8/2) moist; 2 percent clay; strong thin platy structure; soft, friable, nonsticky, nonplastic; many fine interstitial pores; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and*
74 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 9.6 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Bnyyz—1 to 14 inches (2 to 35 centimeters); white (10YR 8/1) gypseriferous loamy sand, very pale brown (10YR 8/2) moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine interstitial pores; finely disseminated gypsum and salt and common fine irregular gypsum masses throughout; noneffervescent, 0 percent calcium carbonate equivalent and 78 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 31.8 dS/m (mmhos/cm); strongly saline; abrupt smooth boundary.

Byyzm—14 to 60 inches (35 to 152 centimeters); very pale brown (10YR 8/2) very strongly cemented material, light gray (10YR 7/2) moist; noneffervescent, 0 percent calcium carbonate equivalent and 76 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 16.6 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

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

Ayyz horizon:
- Hue—10Y or 2.5Y
- Value—6 to 9 dry; 5 to 8 moist
- Chroma—1 to 3, dry or moist
- Texture—gypseriferous sand, gypseriferous loamy sand, or gypseriferous sandy loam
- Clay content—0 to 18 percent
- Gypsum content—40 to 100 percent
- Reaction—slightly alkaline or moderately alkaline

Bnyyz horizon:
- Hue—10YR or 2.5Y
- Value—6 to 9.5 dry; 5 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypseriferous sand, gypseriferous loamy sand, or gypseriferous sandy loam
- Clay content—0 to 18 percent
- Gypsum content—40 to 100 percent
- Reaction—slightly alkaline or moderately alkaline

Byyzm horizon:
- Hardness—strongly cemented or very strongly cemented
- Thickness—10 to 50 inches; laterally continuous

Diagnostic Features
- Ochric epipedon—the zone from 0 to 1 inch (Ayyz horizon)
- Salic horizon—the zone from 1 to 14 inches (Bnyyz horizon)
- Gypsic horizon—the zone from 1 to 14 inches (Bnyyz horizon)
- Petrogypsic horizon—the zone from 14 to 60 inches (Byyzm horizon)

72—Salago-Sabkha association, 0 to 3 percent slopes

Map Unit Setting

Landform(s): Playas (fig. 92)
Elevation: 3,890 to 3,910 feet (1,185 to 1,193 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Salago and similar soils: 70 percent
Sabkha and similar soils: 25 percent
Minor components: 5 percent
  Typic Petrogypsids and similar soils

Description of the Salago Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Typic Aquisalids
Geomorphic position: Playas
Parent material: Gypsiferous lacustrine deposits
Slope: 0 to 3 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—20 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—0 percent
    woody debris—0 percent
    bare soil—80 percent
    rock fragments—0 percent
Depth to restrictive feature(s): 0 inches to salic horizon
Drainage class: Somewhat poorly drained
K_{sat} (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Available water capacity (total inches): 0.0 (very low)
Shrink-swell potential: About 1.1 LEP (low)
Flooding hazard: Very rare
Ponding hazard: Occasional
Depth to seasonal high water table (minimum): About 10 to 31 inches
Runoff class: Negligible
Hydrologic group: B/D
Ecological site name: Gyp Playa
Ecological site number: R042XB008NM
Present vegetation: None
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 50 minutes 1.40 seconds N. and long. 106 degrees 26 minutes 5.00 seconds W.

Cnyyz—0 to 15.5 inches (0 to 40 centimeters); light gray (5Y 7/1) gypsiferous coarse sand, light olive gray (5Y 6/2) moist; 4 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; many medium interstitial pores; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 75 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 43.2 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cnyyzg—15.5 to 27.5 inches (40 to 70 centimeters); gray (N 6/0) gypsiferous coarse sandy loam, greenish gray (5GY 5/1) moist; 8 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; many medium interstitial pores; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 70 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 36.0 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

Cyyzg—27.5 to 60 inches (70 to 152 centimeters); light gray (N 7/0) gypsiferous sandy loam, greenish gray (5GY 6/1) moist; 10 percent clay; massive; hard, very firm, nonsticky, nonplastic; many medium interstitial pores; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 74 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 28.6 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 18 percent

Cnyyz, Cnyyzg, and Cyyzg horizons:
Hue—10YR, 2.5Y, 5Y, 10Y, neutral, or 5GY
Value—4 to 7 dry; 3 to 6 moist
Chroma—1 to 3, dry or moist
Texture—gypsiferous coarse sand, gypsiferous sand, gypsiferous loamy sand, gypsiferous coarse sandy loam, or gypsiferous sandy loam
Clay content—0 to 18 percent
Gypsum content—40 to 90 percent

Diagnostic Features
• Salic horizon—the zone from 0 to 27.5 inches (Cnyyz, Cnyyzg, and Cyyzg horizons)
• Endosaturation—the zone from 21 to 60 inches

Description of the Sabkha Soil

Taxonomic classification: Fine-gypseous, hypergypsic, thermic Typic Aquisalids
Geomorphic position: Playas
Parent material: Gypsiferous lacustrine deposits
Slope: 0 to 3 percent
Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—30 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—0 percent
- woody debris—0 percent
- bare soil—70 percent
- rock fragments—0 percent

Depth to restrictive feature(s): 0 inches to salic horizon

Drainage class: Somewhat poorly drained

$K_{sat}$ (solum): 0.20 to 0.57 inch per hour (1.40 to 4.00 micrometers per second)

Available water capacity (total inches): 0.0 (very low)

Shrink-swell potential: About 3.2 LEP (moderate)

Flooding hazard: Very rare

Ponding hazard: Occasional

Depth to seasonal high water table (minimum): About 26 to 39 inches

Runoff class: Negligible

Hydrologic group: C

Ecological site name: Gyp Playa

Ecological site number: R042XB008NM

Present vegetation: None

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 46 minutes 52.90 seconds N. and long. 106 degrees 26 minutes 15.90 seconds W.

Cnyz—0 to 17.5 inches (0 to 45 centimeters); brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; 34 percent clay; massive; soft, friable, very sticky, very plastic; few fine dendritic tubular pores; finely disseminated carbonate, salt, and gypsum thoroughout; slightly effervescent, 10 percent calcium carbonate equivalent and 11 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 58.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cnyyz—17.5 to 35.5 inches (45 to 90 centimeters); light gray (2.5Y 7/2) gypsiferous loam, light yellowish brown (2.5Y 6/3) moist; 24 percent clay; massive; slightly hard, friable, very sticky, very plastic; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 50 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 64.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cnnyg—35.5 to 60 inches (90 to 152 centimeters); light gray (N 7/0) gypsiferous sandy clay loam, gray (N 5/0) moist; 22 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; many medium interstitial pores; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 52 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 34.4 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 10 to 40 percent
Cnyz, Cnyyz, and Cnyyzg horizons:
Hue—10YR, 2.5Y, 5Y, 10Y, neutral, or 5GY
Value—4 to 8 dry; 3 to 7 moist
Chroma—1 to 3, dry or moist
Texture—gypsiferous loam, gypsiferous silt loam, gypsiferous sandy clay loam,
gypsiferous silty clay loam, or silty clay loam
Clay content—10 to 40 percent
Calcium carbonate equivalent—0 to 10 percent
Gypsum content—11 to 90 percent

Diagnostic Features
- Salic horizon—the zone from 0 to 60 inches (Cnyz, Cnyyz, and Cnyyzg horizons)
- Endosaturation—the zone from 36 to 60 inches

73—Salago-Typic Aquisalids-Petrogypsic Haplosalids complex, 0 to 5 percent slopes

Map Unit Setting
Landform(s): Playa steps and playas (fig. 93)
Elevation: 3,870 to 3,910 feet (1,180 to 1,193 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
**Major Land Resource Area:** 42—Southern Desertic Basins, Plains, and Mountains

**Land Resource Unit:** 42-2 Chihuahuan Desert Shrub

**Map Unit Composition**

Salago and similar soils: 50 percent
Typic Aquisalids and similar soils: 30 percent
Petrogypsic Haplosalids and similar soils: 15 percent
Minor components: 5 percent
   - Typic Petrogypsids with a coarse-gypseous particle-size class and similar soils
   - Typic Haplosalids with a fine-gypseous particle-size class and similar soils
   - Typic Haplosalids with a fine-loamy particle-size class and similar soils

**Description of the Salago Soil**

**Taxonomic classification:** Coarse-gypseous, hypergypsic, thermic Typic Aquisalids
**Geomorphic position:** Playa edges adjacent to fan piedmont terminus
**Parent material:** Gypsiferous lacustrine deposits
**Slope:** 0 to 2 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—30 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—0 percent
  - woody debris—0 percent
  - bare soil—20 percent
  - rock fragments—50 percent

**Depth to restrictive feature(s):** 0 inches to salic horizon

**Drainage class:** Somewhat poorly drained

**S**

| **K sat (solum)** | 0.00 to 5.95 inches per hour (0.01 micrometer to 42.00 micrometers per second) |

**Available water capacity (total inches):** 0.0 (very low)

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

**Flooding hazard:** Very rare

**Ponding hazard:** Occasional

**Depth to seasonal high water table (minimum):** About 0 to 39 inches

**Runoff class:** Negligible

**Hydrologic group:** D

**Ecological site name:** Gyp Playa
**Ecological site number:** R042XB008NM

**Present vegetation:** None

**Land capability classification (nonirrigated areas):** 7c

**Typical Pedon**

**Location by Geographic Coordinate System:** lat. 32 degrees 46 minutes 19.60 seconds N. and long. 106 degrees 25 minutes 55.60 seconds W.

Cnyz—0 to 1.5 inches (0 to 4 centimeters); pale brown (10YR 6/3) silty clay, yellowish brown (10YR 5/4) moist; 45 percent clay; massive; soft, friable, very sticky, very plastic; many very fine vesicular and many very fine irregular pores; finely
disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 46 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 76.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cnzyyz1—1.5 to 14 inches (4 to 35 centimeters); light gray (2.5Y 7/2) gypsiferous channery coarse sand, light yellowish brown (2.5Y 6/3) moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; finely disseminated gypsum and salt throughout; 28 percent flat, very angular, very strongly cemented, 2- to 150-millimeter gypsum crystal fragments; noneffervescent, 0 percent calcium carbonate equivalent and 73 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 32.0 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

Cnzyyz2—14 to 27 inches (35 to 68 centimeters); pale yellow (2.5Y 7/3) gypsiferous channery sand, light olive brown (2.5Y 5/3) moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; finely disseminated gypsum and salt throughout; 15 percent flat, very angular, very strongly cemented, 2- to 150-millimeter gypsum crystal fragments; noneffervescent, 0 percent calcium carbonate equivalent and 73 percent gypsum; slightly alkaline, pH 7.5; electrical conductivity of 38.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cnzyyzg—27 to 60 inches (68 to 152 centimeters); greenish gray (10Y 6/1) gypsiferous sand, greenish gray (10Y 5/1) moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; finely disseminated gypsum and salt throughout; 5 percent flat, very angular, very strongly cemented, 2- to 150-millimeter gypsum crystal fragments; noneffervescent, 0 percent calcium carbonate equivalent and 72 percent gypsum; neutral, pH 7.2; electrical conductivity of 54.0 dS/m (mmhos/cm); strongly saline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 0 to 18 percent  
*Rock fragment content in control section:* 5 to 35 percent

**Cnzyz horizon:**  
Hue—7.5YR, 10YR, or 2.5Y  
Value—5 to 8 dry; 4 to 7 moist  
Chroma—2 to 4, dry or moist  
Texture—sandy loam, gypsiferous sandy loam, silt loam, gypsiferous loam, gypsiferous silt loam, sandy clay loam, gypsiferous sandy clay loam, clay loam, sandy clay, gypsiferous clay, silty clay, or gypsiferous silty clay  
Clay content—8 to 50 percent; average of more than 18 percent  
Gypsum content—15 to 46 percent  
Reaction—slightly alkaline or moderately alkaline

**Cnzyyz and Cnzyyzg horizons:**  
Hue—7.5YR, 10YR, 2.5Y, 10Y, or neutral  
Value—5 to 8 dry; 4 to 7 moist  
Chroma—1 to 3, dry or moist  
Texture—gypsiferous coarse sand, gypsiferous sand, gypsiferous loamy coarse sand, gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous sandy clay loam  
Clay content—0 to 18 percent; average of more than 50 percent fine sand or coarser material  
Rock fragment content—5 to 35 percent  
Gypsum content—40 to 100 percent  
Reaction—neutral to moderately alkaline
Diagnostic Features

- Salic horizon—the zone from 0 to 60 inches (Cnyz, Cnyyz1, Cnyyz2, and Cnyyyzg horizons)
- Endosaturation—the zone from 21.5 to 60 inches

Description of the Typic Aquisalids

**Taxonomic classification:** Typic Aquisalids

**Geomorphic position:** Playa edges adjacent to fan piedmont terminus

**Parent material:** Gypsiferous lacustrine deposits

**Slope:** 0 to 2 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—0 percent
  - woody debris—0 percent
  - bare soil—50 percent
  - rock fragments—50 percent

**Depth to restrictive feature(s):** 0 to 8 inches to salic horizon

**Drainage class:** Moderately well drained

**K_{sat}** (solum): 0.20 to 0.57 inch per hour (1.40 to 4.00 micrometers per second)

**Available water capacity (total inches):** 1.1 (very low)

**Shrink-swell potential:** About 2.7 LEP (low)

**Flooding hazard:** Very rare

**Ponding hazard:** Occasional

**Depth to seasonal high water table (minimum):** About 0 to 39 inches

**Runoff class:** Low

**Hydrologic group:** C

**Ecological site name:** Gyp Playa

**Ecological site number:** R042XB008NM

**Present vegetation:** Alkali sacaton and iodinebush

**Land capability classification (nonirrigated areas):** 7c

Typical Pedon

**Location by Geographic Coordinate System:** lat. 32 degrees 47 minutes 32.30 seconds N. and long. 106 degrees 26 minutes 34.30 seconds W.

**Cyz**—0 to 6.5 inches (0 to 16 centimeters): light gray (10YR 7/2) sandy clay loam, pale brown (10YR 6/3) moist; 24 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine irregular pores; finely disseminated gypsum and salt throughout; noneffervescent, 0 percent calcium carbonate equivalent and 9 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 21.8 dS/m (mmhos/cm); strongly saline; abrupt smooth boundary.

**2Cknyz**—6.5 to 20.5 inches (16 to 52 centimeters): white (2.5Y 8/1) silt loam, white (5Y 8/1) moist; 25 percent clay; massive; slightly hard, friable, very sticky, very plastic; common very fine irregular pores; finely disseminated gypsum, carbonate, and salt throughout; 10 percent flat, very angular, very strongly cemented, 2- to 150-millimeter gypsum crystal fragments; violently effervescent, 45 percent
calcium carbonate equivalent and 2 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 42.6 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

3Cyz—20.5 to 60 inches (52 to 152 centimeters); light gray (5Y 7/2) clay loam, light olive gray (5Y 6/2) moist; 30 percent clay; massive; slightly hard, friable, very sticky, very plastic; common very fine irregular pores; finely disseminated gypsum and salt throughout; 15 percent flat, very angular, very strongly cemented, 2- to 150-millimeter gypsum crystal fragments; noneffervescent, 0 percent calcium carbonate equivalent and 2 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 28.6 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Note: *Typic Aquisalids have soil properties that vary beyond family class limits.*

Clay content of control section (weighted average): 18 to 30 percent
Rock fragment content in control section: 0 to 10 percent

Cyz and 3Cyz horizons:
- Hue—7.5YR, 10YR, 2.5Y, 5Y, or neutral
- Value—5 to 8 dry; 4 to 7 moist
- Chroma—1 to 3, dry or moist
- Texture—sandy loam, sandy clay loam, loam, silt loam, or clay loam
- Clay content—18 to 35 percent
- Rock fragment content—0 to 15 percent
- Gypsum content—0 to 10 percent
- Reaction—slightly alkaline or moderately alkaline

2Cknyz horizon:
- Hue—7.5YR, 10YR, 2.5Y, 5Y, or neutral
- Value—5 to 8 dry; 4 to 7 moist
- Chroma—1 to 3, dry or moist
- Texture—sandy loam, sandy clay loam, loam, silt loam, clay loam, or clay
- Clay content—18 to 50 percent
- Rock fragment content—0 to 15 percent
- Gypsum content—0 to 10 percent
- Calcium carbonate equivalent—30 to 60 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features

- Salic horizon—the zone from 6.5 to 20.5 inches (2Cknyz horizon)
- Endosaturation—the zone from 32.5 to 60 inches

Description of the Petrogypsic Haplosalids

Taxonomic classification: Petrogypsic Haplosalids
Geomorphic position: Playa edges adjacent to fan piedmont terminus
Parent material: Gypsiferous lacustrine deposits
Slope: 0 to 5 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—5 percent
  - gypsum crystals—25 percent
Physical cover:
- canopy plant cover—0 percent
- woody debris—0 percent
- bare soil—70 percent
- rock fragments—25 percent channers

*Depth to restrictive feature(s):* 0 inches to salic horizon; 19.5 to 35.5 inches to petrogypsic horizon

*Drainage class:* Well drained

*K_{sat} (solum):* 0.00 to 0.57 inch per hour (0.01 micrometer to 4.00 micrometers per second)

*K_{sat} (restrictive layer):* 0.00 inches per hour (0.00 to 0.02 micrometer per second)

*Available water capacity (total inches):* 0.0 (very low)

*Shrink-swell potential:* About 7.6 LEP (high)

*Flooding hazard:* Very rare

*Ponding hazard:* Occasional

*Runoff class:* Negligible

*Hydrologic group:* D

*Ecological site name:* Alkali Flat

*Ecological site number:* R042XB001NM

*Present vegetation:* None

*Land capability classification (nonirrigated areas):* 7c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 32 degrees 46 minutes 44.10 seconds N. and long. 106 degrees 26 minutes 26.50 seconds W.

*Cknyz1—0 to 2 inches (0 to 5 centimeters);* light gray (10YR 7/2) gypsiferous sandy clay loam, light brownish gray (10YR 6/2) moist; 32 percent clay; massive; hard, firm, very sticky, moderately plastic; common very fine irregular pores; finely disseminated gypsum and salt throughout; violently effervescent, 17 percent calcium carbonate equivalent and 26 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 66.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

*Cknyz2—2 to 12.5 inches (5 to 32 centimeters);* white (2.5Y 8/1) silty clay, light gray (2.5Y 7/1) moist; 45 percent clay; massive; hard, firm, very sticky, moderately plastic; common very fine irregular pores; finely disseminated gypsum and salt throughout; violently effervescent, 38 percent calcium carbonate equivalent and 5 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 52.0 dS/m (mmhos/cm); strongly saline; gradual smooth boundary.

*Cknyz3—12.5 to 33 inches (32 to 84 centimeters);* 40 percent light yellowish brown (2.5Y 6/3) and 60 percent white (2.5Y 9/1) silty clay, 40 percent light olive brown (2.5Y 5/3) and 60 percent white (2.5Y 8/1) moist; 50 percent clay; massive; hard, firm, very sticky, moderately plastic; common very fine irregular pores; finely disseminated gypsum and salt throughout; violently effervescent, 36 percent calcium carbonate equivalent and 5 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 42.0 dS/m (mmhos/cm); strongly saline; abrupt smooth boundary.

*2Bknyyzm—33 to 60 inches (84 to 152 centimeters);* white (2.5Y 8/1) very strongly cemented material, light gray (2.5Y 7/1) moist; violently effervescent, 25 percent calcium carbonate equivalent and 42 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 40.0 dS/m (mmhos/cm); strongly saline.
Range in Characteristics

Note: Petrogypsic Haplosalids have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 18 to 50 percent

Cknyz horizons:
- Hue—7.5YR, 10YR, or 2.5Y
- Value—5 to 9 dry; 4 to 8 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sandy clay loam, clay loam, sandy clay, gypsisferous clay, or gypsiferous silty clay
- Clay content—18 to 50 percent
- Calcium carbonate equivalent—20 to 40 percent
- Gypsum content—0 to 30 percent
- Reaction—slightly alkaline or moderately alkaline

2Bknyyzm horizon:
- Hardness—strongly cemented or very strongly cemented
- Thickness—5 to 30 inches; laterally discontinuous

Diagnostic Features
- Salic horizon—the zone from 0 to 33 inches (Cknyz1, Cknyz2, and Cknyz3 horizons)
- Petrogypsic horizon—the zone from 33 to 60 inches (2Bknyyzm horizon)

74—Shot gypsiferous fine sandy loam, 1 to 20 percent slopes

Map Unit Setting

Landform(s): Dunes (fig. 94)
Elevation: 3,900 to 4,120 feet (1,190 to 1,255 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Shot and similar soils: 85 percent
Minor components: 15 percent
  - Aerobee and similar soils
  - Bigsalt and similar soils
  - Hembrillo and similar soils
  - Shot soils that have a clayey lacustrine substratum and similar soils

Description of the Shot Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: Footslopes, backslopes, shoulders, and summits of playa dunes
Parent material: Gypsiferous eolian sands
Slope: 1 to 20 percent
Surface cover
  - Biological crust:
    - cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—25 percent
Chemical crust:
salt—0 percent
gypsum—0 percent
Physical cover:
canopy plant cover—35 percent
woody debris—25 percent
bare soil—40 percent
rock fragments—0 percent
Drainage class: Excessively drained
$K_{sat}$ (solum): 0.57 inch to 19.98 inches per hour (4.00 to 141.00 micrometers per second)
Available water capacity (total inches): 4.3 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: B
Ecological site name: Gyp Upland
Ecological site number: R042XB006NM
Present vegetation: Alkali sacaton, fourwing saltbush, Torrey ephedra, soaptree yucca, broom dalea, and honey mesquite
Land capability classification (nonirrigated areas): 7c
Typical Pedon (fig. 95)
Location by Geographic Coordinate System: lat. 33 degrees 2 minutes 17.60 seconds N. and long. 106 degrees 26 minutes 17.12 seconds W.
Ay—0 to 1 inch (0 to 3 centimeters); pink (7.5YR 7/4) gypsiferous fine sandy loam, brown (7.5YR 5/4) moist; 16 percent clay; weak thin platy structure; slightly hard, friable, nonsticky, nonplastic; few fine roots throughout; few medium and common fine tubular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 31 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 3.1 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.
Byy1—1 to 8 inches (3 to 20 centimeters); pink (7.5YR 7/3) gypsiferous sand, brown (7.5YR 5/4) moist; 3 percent clay; weak coarse and very coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few fine interstitial pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 38 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 3.6 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

Byy2—8 to 19.5 inches (20 to 50 centimeters); light brown (7.5YR 6/4) gypsiferous loamy sand, strong brown (7.5YR 4/6) moist; 5 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; few very fine and fine interstitial pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 51 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Byy3—19.5 to 33.5 inches (50 to 85 centimeters); brown (7.5YR 5/4) gypsiferous loamy sand, strong brown (7.5YR 4/6) moist; 6 percent clay; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few very fine and fine interstitial pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 49 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.9 dS/m (mmhos/cm); very slightly saline; abrupt wavy boundary.

2Byy—33.5 to 40.5 inches (85 to 103 centimeters); light brown (7.5YR 6/4) gypsiferous loam, strong brown (7.5YR 4/6) moist; 24 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots throughout; few fine and medium tubular pores; finely disseminated carbonate throughout and common fine irregular gypsum crystal clusters on faces of peds; strongly effervescent, 4 percent calcium carbonate equivalent and 29 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 4.9 dS/m (mmhos/cm); slightly saline; abrupt wavy boundary.

3Cyy—40.5 to 59 inches (103 to 150 centimeters); strong brown (7.5YR 5/6) gypsiferous loamy sand, strong brown (7.5YR 4/6) moist; 5 percent clay; massive; soft, very friable, nonsticky, nonplastic; few medium interstitial pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 49 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 5.8 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 5 to 24 percent; average of less than 6 percent

Other characteristics: Some pedons do not have a 2Byy horizon; some pedons do not have a 3Cyy horizon

Ay horizon:
Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—4 to 6, dry or moist
Texture—gypsiferous loamy fine sand, gypsiferous fine sandy loam, or gypsiferous loam
Clay content—5 to 18 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—nonsaline or very slightly saline
Gypsum content—30 to 50 percent
**Byy and 2Byy horizons:**

- **Hue**: 5YR or 7.5YR
- **Value**: 5 to 7 dry; 4 to 6 moist
- **Chroma**: 3 to 6, dry or moist
- **Texture**: gypsumiferous sand, gypsumiferous loamy sand, gypsumiferous loamy fine sand, gypsumiferous loam, or gypsumiferous fine sandy loam
- **Clay content**: 3 to 24 percent
- **Reaction**: slightly alkaline or moderately alkaline
- **Salinity**: very slightly saline or moderately saline
- **Gypsum content**: 29 to 60 percent

**3Cyy horizon:**

- **Hue**: 5YR or 7.5YR
- **Value**: 4 to 6 dry; 4 to 6 moist
- **Chroma**: 4 to 6, dry or moist
- **Texture**: gypsumiferous loamy sand or gypsumiferous loamy fine sand
- **Clay content**: 5 to 10 percent
- **Reaction**: slightly alkaline or moderately alkaline
- **Salinity**: very slightly saline or moderately saline
- **Gypsum content**: 40 to 60 percent

**Diagnostic Features**

- Ochric epipedon—the zone from 0 to 1 inch (Ay horizon)
- Gypsic horizon—the zone from 1 to 40.5 inches (Byy1, Byy2, Byy3, and 2Byy horizons)

### 75—Shot-Aerobee association, 0 to 15 percent slopes

#### Map Unit Setting

- **Landform(s)**: Dunes and interdunes (fig. 96)
- **Elevation**: 4,010 to 4,070 feet (1,222 to 1,240 meters)
- **Mean annual precipitation**: 8 to 12 inches (203 to 305 millimeters)
- **Mean annual air temperature**: 64 to 70 degrees F (18.0 to 21.0 degrees C)
- **Mean annual soil temperature**: 66 to 72 degrees F (19.1 to 22.1 degrees C)
- **Frost-free period**: 180 to 240 days
- **Major Land Resource Area**: 42—Southern Desertic Basins, Plains, and Mountains
- **Land Resource Unit**: 42-2 Chihuahuan Desert Shrub

#### Map Unit Composition

- Shot and similar soils: 63 percent
- Aerobee and similar soils: 33 percent
- Minor components: 4 percent
  - Gypsic Haplosalids and similar soils
  - Hembrillo and similar soils
  - Slickcity and similar soils
  - Yesum and similar soils
  - Duneland

#### Description of the Shot Soil

- **Taxonomic classification**: Coarse-gypseous, hypergypseic, thermic Leptic Haplogypsids
- **Geomorphic position**: Dunes
- **Parent material**: Gypsumiferous eolian sands
- **Slope**: 1 to 15 percent
Figure 96.—An area of map unit 75 (Shot-Aerobee association, 0 to 15 percent slopes).

Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—60 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—2 percent
- Physical cover:
  - canopy plant cover—25 percent
  - woody debris—5 percent
  - bare soil—25 percent
  - rock fragments—0 percent

Drainage class: Excessively drained

$K_{sat}$ (solum): 1.98 to 99.92 inches per hour (14.00 to 705.00 micrometers per second)

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

Shrink-swell potential: About 1.5 LEP (low)

Flooding hazard: None

Runoff class: Very low

Hydrologic group: A

Ecological site name: Gyp Upland

Ecological site number: R042XB006NM

Present vegetation: Alkali sacaton, fourwing saltbush, Torrey’s jointfir, and wolfberry

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 97)

Location by Geographic Coordinate System: lat. 33 degrees 6 minutes 39.00 seconds N. and long. 106 degrees 20 minutes 4.12 seconds W.
Ay—0 to 1 inch (0 to 3 centimeters); light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/3) moist; 15 percent clay; weak medium platy structure; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; many very fine interstitial pores; finely disseminated carbonate and gypsum and common very fine irregular gypsum crystal clusters throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 4 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 1.9 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.

Byy1—1 to 12 inches (3 to 30 centimeters); pinkish white (7.5YR 8/2) gypsiferous sand, pink (7.5YR 7/4) moist; 5 percent clay; weak coarse subangular blocky
structure; soft, very friable, nonsticky, nonplastic; few very fine and few fine roots throughout; many very fine interstitial pores; finely disseminated carbonate, many fine irregular gypsum crystals, and common fine and common medium irregular gypsum crystal clusters throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 78 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 2.4 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

**Byy2**—12 to 23.5 inches (30 to 60 centimeters); pink (7.5YR 7/4) gypsiferous sand, brown (7.5YR 5/4) moist; 5 percent clay; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few medium and few fine roots throughout; many very fine interstitial pores; finely disseminated carbonate, many fine irregular gypsum crystals, and common very fine irregular gypsum crystal clusters throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 53 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 4.3 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

**Byy3**—23.5 to 39.5 inches (60 to 100 centimeters); light brown (7.5YR 6/4) gypsiferous sand, strong brown (7.5YR 4/6) moist; 3 percent clay; weak coarse subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine roots throughout; many very fine interstitial pores; finely disseminated carbonate, many fine irregular gypsum crystals, and common very fine irregular gypsum crystal clusters throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 60 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 3.9 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

**Cyy**—39.5 to 55 inches (100 to 140 centimeters); light brown (7.5YR 6/4) gypsiferous sand, brown (7.5YR 5/4) moist; 1 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; few very fine roots throughout; many very fine interstitial pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 4 percent calcium carbonate equivalent and 46 percent gypsum; moderately alkaline, pH 8.4; electrical conductivity of 6.8 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

**Cyyz**—55 to 60 inches (140 to 152 centimeters); light brown (7.5YR 6/4) gypsiferous sand, brown (7.5YR 4/4) moist; 1 percent clay; massive; slightly hard, friable, nonsticky, nonplastic; few very fine roots throughout; many very fine interstitial pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 51 percent gypsum; strongly alkaline, pH 8.5; electrical conductivity of 8.4 dS/m (mmhos/cm); moderately saline.

### Range in Characteristics

*Clay content of control section (weighted average): 1 to 5 percent*

**Ay horizon:**
- **Hue**—5YR or 7.5YR
- **Value**—5 to 7 dry; 4 to 6 moist
- **Chroma**—3 to 6, dry or moist
- **Texture**—loamy sand or sandy loam
- **Clay content**—5 to 17 percent
- **Calcium carbonate equivalent**—0 to 10 percent
- **Gypsum content**—2 to 25 percent
- **Salinity**—nonsaline or very slightly saline

**Byy horizons:**
- **Hue**—5YR or 7.5YR
- **Value**—6 to 8 dry; 4 to 7 moist
Chroma—2 to 6, dry or moist
Texture—gypsiferous sand or gypsiferous loamy sand
Clay content—1 to 10 percent
Calcium carbonate equivalent—0 to 4 percent
Gypsum content—40 to 80 percent
Reaction—slightly alkaline to strongly alkaline
Salinity—very slightly saline or slightly saline

Cyy and Cyyz horizons:
Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—3 to 6, dry or moist
Texture—gypsiferous sand or gypsiferous loamy sand
Clay content—1 to 5 percent
Calcium carbonate equivalent—0 to 4 percent
Gypsum content—40 to 60 percent
Reaction—slightly alkaline to strongly alkaline
Salinity—very slightly saline or moderately saline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 1 inch (Ay horizon)
• Gypsic horizon—the zone from 1 to 39.5 inches (Byy1, Byy2, and Byy3 horizons)

Description of the Aerobee Soil

Taxonomic classification: Fine-loamy, gypsic, thermic Leptic Haplogypsids
Geomorphic position: Interdunes
Parent material: Gypsiferous fine-loamy alluvium
Slope: 0 to 3 percent
Surface cover
   Biological crust:
      cyanobacteria—0 percent
      lichen—0 percent
      moss—0 percent
      cryptogamic crust—10 percent
   Chemical crust:
      salt—0 percent
      gypsum—0 percent
Physical cover:
    canopy plant cover—40 percent
    woody debris—25 percent
    bare soil—35 percent
    rock fragments—0 percent

Drainage class: Well drained
K_{sat} (solum): 0.57 inch to 19.98 inches per hour (4.00 to 141.00 micrometers per second)
Available water capacity (total inches): 9.0 (high)
Shrink-swell potential: About 2.1 LEP (low)
Flooding hazard: None
Runoff class: Low
Hydrologic group: B
Ecological site name: Loamy
Ecological site number: R042XB014NM
Present vegetation: Alkali sacaton, fourwing saltbush, Torrey’s jointfir, boxthorn, and creosote bush

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 98)

Location by Geographic Coordinate System: lat. 33 degrees 6 minutes 33.54 seconds N. and long. 106 degrees 20 minutes 8.69 seconds W.
Ay—0 to 2 inches (0 to 5 centimeters); pink (7.5YR 7/3) loam, brown (7.5YR 4/4) moist; 23 percent clay; moderate thin and medium platy over weak fine subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate and gypsum throughout; strongly effervescent, 14 percent calcium carbonate equivalent and 5 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

By1—2 to 15.5 inches (5 to 40 centimeters); pink (7.5YR 7/4) gypseriferous loam, brown (7.5YR 4/4) moist; 21 percent clay; moderate coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; common medium roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and common fine irregular gypsum crystal clusters throughout; strongly effervescent, 12 percent calcium carbonate equivalent and 32 percent gypsum; slightly alkaline, pH 7.5; electrical conductivity of 7.4 dS/m (mmhos/cm); slightly saline; gradual smooth boundary.

By2—15.5 to 31.5 inches (40 to 80 centimeters); light brown (7.5YR 6/4) gypseriferous sandy clay loam, strong brown (7.5YR 4/6) moist; 21 percent clay; moderate coarse prismatic structure parting to moderate medium subangular blocky; moderately hard, firm, slightly sticky, slightly plastic; common fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate and common fine irregular gypsum crystal clusters throughout; strongly effervescent, 11 percent calcium carbonate equivalent and 30 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 5.8 dS/m (mmhos/cm); slightly saline; gradual wavy boundary.

By3—31.5 to 43.5 inches (80 to 110 centimeters); light brown (7.5YR 6/4) gypseriferous sandy clay loam, brown (7.5YR 4/4) moist; 22 percent clay; weak medium and coarse subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; common fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and common fine irregular gypsum crystal clusters throughout; slightly effervescent, 8 percent calcium carbonate equivalent and 38 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 5.6 dS/m (mmhos/cm); slightly saline; gradual wavy boundary.

By4—43.5 to 59 inches (110 to 150 centimeters); pink (7.5YR 7/4) gypseriferous sandy loam, strong brown (7.5YR 5/6) moist; 10 percent clay; weak medium subangular blocky structure; hard, very firm, nonsticky, nonplastic; few fine and medium roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate and common fine irregular gypsum crystal clusters throughout; slightly effervescent, 5 percent calcium carbonate equivalent and 42 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 4.1 dS/m (mmhos/cm); slightly saline; gradual wavy boundary.

2Cy—59 to 60 inches (150 to 152 centimeters); pink (7.5YR 7/4) gypseriferous loamy sand, strong brown (7.5YR 5/6) moist; 3 percent clay; massive; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; finely disseminated carbonate and many fine irregular gypsum crystals throughout; very slightly effervescent, 1 percent calcium carbonate equivalent and 43 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 4.5 dS/m (mmhos/cm); slightly saline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 18 to 35 percent

*Ay 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  
Clay content—18 to 27 percent  
Calcium carbonate equivalent—5 to 15 percent  
Gypsum content—5 to 20 percent  
Reaction—slightly alkaline or moderately alkaline  
Salinity—very slightly saline or slightly saline

By horizons:
Hue—5YR or 7.5YR  
Value—5 to 7 dry; 4 to 6 moist  
Chroma—3 to 6, dry or moist  
Texture—gypsiferous sandy loam, gypsiferous loam, gypsiferous sandy clay loam, or gypsiferous clay loam  
Clay content—10 to 35 percent  
Calcium carbonate equivalent—2 to 12 percent  
Gypsum content—15 to 45 percent  
Reaction—slightly alkaline or moderately alkaline  
Salinity—very slightly saline or moderately saline

2Cy horizon:
Hue—5YR or 7.5YR  
Value—5 to 7 dry; 4 to 6 moist  
Chroma—3 to 6, dry or moist  
Texture—gypsiferous loamy sand, gypsiferous sandy loam, gypsiferous loam, gypsiferous sandy clay loam, or gypsiferous clay loam  
Clay content—3 to 35 percent  
Calcium carbonate equivalent—0 to 5 percent  
Gypsum content—15 to 43 percent  
Reaction—slightly alkaline or moderately alkaline  
Salinity—very slightly saline or moderately saline

Diagnostic Features  
• Ochric epipedon—the zone from 0 to 2 inches (Ay horizon)  
• Gypsic horizon—the zone from 2 to 59 inches (By1, By2, By3, and By4 horizons)

76—Stagecoach-Delnorte-Riverwash association, 0 to 35 percent slopes

Map Unit Setting

Landform(s): Channels and fan remnants (fig. 99)  
Elevation: 3,940 to 6,410 feet (1,200 to 1,955 meters)  
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)  
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)  
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)  
Frost-free period: 180 to 240 days  
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains  
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Stagecoach and similar soils: 45 percent  
Delnorte and similar soils: 25 percent  
Riverwash: 20 percent
Minor components: 10 percent
  Queencreek and similar soils
  Vado and similar soils

Description of the Stagecoach Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Typic Haplocalcids
Geomorphic position: Backslopes of fan remnants
Parent material: Gravelly coarse-loamy alluvium
Slope: 10 to 35 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—20 percent
    woody debris—7 percent

Figure 99.—An area of map unit 76 (Stagecoach-Delnorte-Riverwash association, 0 to 35 percent slopes).
bare soil—10 percent
rock fragments—55 percent gravel, 5 percent cobbles, and 2 percent stones

Drainage class: Well drained

\( K_{\text{sat}} \) (solum): 19.98 to 99.64 inches per hour (141.00 to 703.00 micrometers per second)

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

Shrink-swell potential: About 0.7 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: A

Ecological site name: Gravelly

Ecological site number: R042XB010NM

Present vegetation: Bush muhly, creosotebush, banana yucca, mariola, and ocotillo

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 100)

Location by Geographic Coordinate System: lat. 32 degrees 36 minutes 15.87 seconds N. and long. 106 degrees 26 minutes 47.83 seconds W.

A—0 to 3 inches (0 to 8 centimeters); brown (7.5YR 5/3) very gravelly sandy loam, brown (7.5YR 4/4) moist; 14 percent clay; weak medium and coarse subangular blocky structure; soft, friable, nonsticky, nonplastic; few very fine and fine roots throughout; few fine and medium tubular pores; many distinct carbonate coats on rock fragments; 45 percent gravel and 5 percent cobbles; strongly effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; abrupt wavy boundary.

Bk1—3 to 8.5 inches (8 to 22 centimeters); light brown (7.5YR 6/3) extremely gravelly sandy loam, brown (7.5YR 5/4) moist; 12 percent clay; weak medium and coarse subangular blocky structure; soft, friable, nonsticky, nonplastic; few very fine and medium and common fine roots throughout; few fine and medium tubular pores; many distinct carbonate coats on rock fragments; common fine, medium, and coarse irregular carbonate nodules throughout; 70 percent gravel, 5 percent cobbles, and 5 percent stones; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk2—8.5 to 17.5 inches (22 to 44 centimeters); pale brown (10YR 6/3) extremely gravelly sandy loam, yellowish brown (10YR 5/4) moist; 10 percent clay; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few very fine, fine, and medium roots throughout; very many prominent carbonate coats on rock fragments; many fine irregular carbonate masses and common fine and medium and few coarse irregular carbonate nodules throughout; 70 percent gravel, 10 percent cobbles, and 3 percent stones; violently effervescent, 28 percent calcium carbonate equivalent; strongly alkaline, pH 8.5; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Bk3—17.5 to 35.5 inches (44 to 90 centimeters); very pale brown (10YR 7/3) extremely gravelly sandy loam, pale brown (10YR 6/3) moist; 10 percent clay; weak fine subangular blocky structure; soft, friable, slightly sticky, nonplastic; few very fine and fine roots throughout; many distinct carbonate coats on rock fragments; many fine irregular carbonate masses and common fine medium and coarse irregular carbonate nodules throughout; 65 percent gravel, 15 percent cobbles, and 3 percent stones; violently effervescent, 30 percent calcium carbonate equivalent; strongly alkaline, pH 8.6; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Ck—35.5 to 60 inches (90 to 152 centimeters); pale brown (10YR 6/3) extremely gravelly sand, brown (10YR 4/3) moist; 2 percent clay; single grain; loose, loose,
nonsticky, nonplastic; few faint carbonate coats on bottom surfaces of rock fragments; common fine irregular carbonate nodules throughout; 70 percent gravel, 15 percent cobbles, and 3 percent stones; strongly effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 5 to 18 percent
Rock fragment content in control section: 35 to 93 percent
Other characteristics: Some pedons do not have a Ck horizon

Figure 100.—Profile of the Stagecoach soil in map unit 76 (Stagecoach-Delnorte-Riverwash association, 0 to 35 percent slopes).
A horizon:
  Hue—7.5YR or 10YR
  Value—5 to 6 dry; 3 to 4 moist
  Chroma—3 to 4, dry or moist
  Texture—coarse sandy loam, sandy loam, or fine sandy loam
  Clay content—8 to 17 percent
  Rock fragment content—35 to 70 percent

Bk horizons:
  Hue—7.5YR or 10YR
  Value—6 to 8 dry; 5 to 7 moist
  Chroma—2 to 4, dry or moist
  Texture—coarse sandy loam or sandy loam
  Clay content—10 to 18 percent
  Rock fragment content—35 to 93 percent
  Reaction—slightly alkaline to strongly alkaline
  Salinity—nonsaline to slightly saline
  Calcium carbonate equivalent—15 to 35 percent

Ck horizon:
  Chroma—2 to 3, dry or moist
  Clay content—0 to 5 percent
  Rock fragment content—60 to 88 percent
  Calcium carbonate equivalent—15 to 25 percent

Diagnostic Features
- Ochric epipedon—the zone from 0 to 3 inches (A horizon)
- Calcic horizon—the zone from 3 to 35.5 inches (Bk1, Bk2, and Bk3 horizons)

Description of the Delnorte Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic, shallow Calcic Petrocalcids

Geomorphic position: Summits and shoulders of fan remnants

Parent material: Gravelly coarse-loamy alluvium

Slope: 1 to 10 percent

Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—35 percent
  - woody debris—6 percent
  - bare soil—0 percent
  - rock fragments—90 percent gravel, 3 percent cobbles, and 1 percent stones

Depth to restrictive feature(s): 7 to 9 inches to petrocalcic horizon

Drainage class: Moderately well drained

$K_{sat}$ (solum): 1.98 to 99.92 inches per hour (14.00 to 705.00 micrometers per second)

$K_{sat}$ (restrictive layer): 0.00 inches per hour (0.00 to 0.02 micrometer per second)

Available water capacity (total inches): 0.7 (very low)

Shrink-swell potential: About 1.0 LEP (low)
Flooding hazard: None
Runoff class: Very high
Hydrologic group: D
Ecological site name: Gravelly
Ecological site number: R042XB010NM
Present vegetation: Bush muhly, creosotebush, mariola, banana yucca, and ocotillo
Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 101)

Location by Geographic Coordinate System: lat. 32 degrees 36 minutes 19.63 seconds N. and long. 106 degrees 26 minutes 56.75 seconds W.

A—0 to 1 inch (0 to 2 centimeters); light brown (7.5YR 6/4) gravelly sandy loam, brown (7.5YR 4/3) moist; 14 percent clay; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; few fine tubular pores; finely disseminated carbonate throughout; 30 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk—1 to 7.5 inches (2 to 19 centimeters); light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; 16 percent clay; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine, medium, and coarse roots throughout; few very fine and fine tubular pores; very many prominent carbonate coats on rock fragments; common fine irregular carbonate masses throughout; 43 percent gravel; violently effervescent, 17 percent calcium carbonate equivalent; strongly alkaline, pH 8.5; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; very abrupt wavy boundary.

Bkm—7.5 to 17 inches (19 to 43 centimeters); white (7.5YR 8/1) cemented material, pink (7.5YR 7/3) moist; massive; few fine and medium roots at top of horizon; violently effervescent, 52 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk1—17 to 30.5 inches (43 to 78 centimeters); pinkish gray (7.5YR 7/2) very gravelly sandy loam, light brown (7.5YR 6/3) moist; 8 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine and medium roots throughout; very many prominent carbonate coats on rock fragments; common fine, medium, and coarse irregular carbonate nodules throughout and many fine irregular carbonate masses in matrix; 33 percent gravel, 5 percent cobbles, and 5 percent stones; violently effervescent, 40 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline; gradual wavy boundary.

Bk2—30.5 to 60 inches (78 to 152 centimeters); pinkish gray (7.5YR 7/2) very gravelly loamy sand, light brown (7.5YR 6/3) moist; 4 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; many prominent carbonate coats on rock fragments; common fine and coarse and many medium irregular carbonate nodules throughout and many fine irregular carbonate masses in matrix; 34 percent gravel, 15 percent cobbles, and 5 percent stones; violently effervescent, 34 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 6.6 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 10 to 17 percent
Rock fragment content in control section: 35 to 65 percent
A horizon:
Hue—7.5YR or 10YR
Value—5 to 6 dry; 4 to 5 moist
Chroma—3 to 4, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 17 percent  
Rock fragment content—30 to 45 percent

**Bk horizon:**  
Hue—7.5YR or 10YR  
Value—6 to 7 dry; 4 to 6 moist  
Chroma—3 to 4, dry or moist  
Texture—sandy loam, fine sandy loam, or loam  
Clay content—10 to 17 percent  
Rock fragment content—35 to 65 percent  
Reaction—moderately alkaline or strongly alkaline  
Calcium carbonate equivalent—10 to 25 percent

**Bkkm horizon:**  
Cemented material—calcium carbonate  
Hardness—extremely hard or indurated  
Thickness—8 to 14 inches; laterally continuous

**Bkk horizons:**  
Hue—7.5YR or 10YR  
Value—7 to 8 dry; 6 to 7 moist  
Chroma—2 to 3, dry or moist  
Texture—loamy sand, sandy loam, or fine sandy loam  
Clay content—4 to 17 percent  
Rock fragment content—10 to 85 percent  
Salinity—nonsaline to slightly saline  
Calcium carbonate equivalent—15 to 40 percent

**Diagnostic Features**  
- Ochric epipedon—the zone from 0 to 1 inch (A horizon)  
- Calcic horizon—the zone from 1 to 7.5 inches (Bk horizon)  
- Petrocalcic horizon—the zone from 7.5 to 17 inches (Bkkm horizon)

**Description of Riverwash**

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

**77—Stronghold-Mallet complex, 1 to 16 percent slopes**

**Map Unit Setting**

*Landform(s):* Fan remnants (fig. 102)  
*Elevation:* 4,780 to 5,720 feet (1,458 to 1,745 meters)  
*Mean annual precipitation:* 12 to 14 inches (305 to 356 millimeters)  
*Mean annual air temperature:* 61 to 64 degrees F (16.0 to 18.0 degrees C)  
*Mean annual soil temperature:* 63 to 66 degrees F (17.1 to 19.1 degrees C)  
*Frost-free period:* 180 to 240 days  
*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains  
*Land Resource Unit:* 42-3 Chihuahuan Desert Grassland

**Map Unit Composition**

Stronghold and similar soils: 50 percent  
Mallet and similar soils: 35 percent  
Minor components: 15 percent  
  Ustic Haplocambids with a loamy-skeletal particle-size class and similar soils
Nasa and similar soils
Yesum and similar soils
Riverwash

**Description of the Stronghold Soil**

*Taxonomic classification:* Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcids
*Geomorphic position:* Stabilized fan remnants
*Parent material:* Alluvium
*Slope:* 1 to 16 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—35 percent
  - woody debris—5 percent
  - bare soil—60 percent
  - rock fragments—7 percent gravel

*Drainage class:* Somewhat excessively drained
*K* <sub>s</sub> (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

**Available water capacity (total inches):** 6.5 (moderate)
**Shrink-swell potential:** About 1.5 LEP (low)
**Flooding hazard:** None
Runoff class: Very low
Hydrologic group: A
Ecological site name: Sandy
Ecological site number: R042XC004NM
Present vegetation: Creosote bush and tarbush
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 41 minutes 48.10 seconds N. and long. 106 degrees 28 minutes 27.60 seconds W.

A—0 to 2.5 inches (0 to 6 centimeters); brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/4) moist; 14 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots throughout; few fine irregular pores; finely disseminated carbonate throughout; 15 percent gravel; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.1 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw—2.5 to 22 inches (6 to 56 centimeters); brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/3) moist; 18 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few fine roots throughout; few fine irregular pores; finely disseminated carbonate and few fine irregular carbonate masses throughout; 21 percent gravel; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk—22 to 60 inches (56 to 152 centimeters); pinkish white (7.5YR 8/2) gravelly loam, light brown (7.5YR 6/3) moist; 17 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few fine irregular pores; finely disseminated carbonate and common fine irregular carbonate masses throughout; 22 percent gravel; strongly effervescent, 24 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 15 to 18 percent
Rock fragment content in control section: 0 to 25 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy loam or fine sandy loam
- Clay content—8 to 18 percent
- Rock fragment content—0 to 20 percent
- Calcium carbonate equivalent—0 to 6 percent
- Reaction—slightly alkaline or moderately alkaline

Bw horizon:
- Hue—7.5YR or 10YR
- Value—4 to 7 dry; 3 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy loam, fine sandy loam, or loam
- Clay content—10 to 22 percent
- Rock fragment content—0 to 25 percent
- Calcium carbonate equivalent—0 to 6 percent
- Reaction—slightly alkaline or moderately alkaline
Bk horizon:
  Hue—7.5YR or 10YR
  Value—5 to 8, dry or moist
  Chroma—2 to 3, dry or moist
  Texture—sandy loam, fine sandy loam, or loam
  Clay content—10 to 22 percent
  Rock fragment content—0 to 25 percent
  Calcium carbonate equivalent—15 to 30 percent
  Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
• Cambic horizon—the zone from 2 to 22 inches (Bw horizon)
• Calcic horizon—the zone from 22 to 60 inches (Bk horizon)

Description of the Mallet Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Ustic
  Haplocambids
Geomorphic position: Stabilized fan remnants
Parent material: Alluvium
Slope: 1 to 16 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
Physical cover:
  canopy plant cover—35 percent
  woody debris—5 percent
  bare soil—50 percent
  rock fragments—10 percent gravel and 5 percent cobbles
Drainage class: Somewhat excessively drained
K sat (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Available water capacity (total inches): 6.0 (moderate)
Shrink-swell potential: About 1.6 LEP (low)
Flooding hazard: None
Runoff class: Very low
Hydrologic group: A
Ecological site name: Sandy
Ecological site number: R042XC004NM
Present vegetation: Broom snakeweed, creosote bush, and honey mesquite
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 41 minutes 40.60 seconds N. and long. 106 degrees 28 minutes 11.50 seconds W.

A—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; 15 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine and fine roots throughout; few very fine irregular pores; finely disseminated carbonate
throughout; 5 percent gravel; slightly effervescent, 1 percent calcium carbonate equivalent; neutral, pH 7.3; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bw1—4 to 32 inches (10 to 81 centimeters); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; 17 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; few very fine irregular pores; finely disseminated carbonate throughout; 10 percent gravel; slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 1.0 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bw2—32 to 60 inches (81 to 152 centimeters); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; 15 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; few very fine irregular pores; finely disseminated carbonate throughout; 12 percent gravel; slightly effervescent, 2 percent calcium carbonate equivalent; slightly alkaline, pH 7.4; electrical conductivity of 0.9 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 10 to 18 percent
Rock fragment content in control section: 0 to 25 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—3 to 5 dry; 2.5 to 4 moist
- Chroma—2 to 4, dry or moist
- Texture—sandy loam or fine sandy loam
- Clay content—8 to 18 percent
- Reaction—neutral or slightly alkaline

Bw horizons:
- Hue—7.5YR or 10YR
- Value—3 to 6 dry; 2.5 to 5 moist
- Chroma—1 to 4, dry or moist
- Texture—coarse sandy loam, sandy loam, fine sandy loam, or loam
- Clay content—10 to 22 percent
- Rock fragment content—5 to 25 percent
- Reaction—neutral or slightly alkaline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw1 horizons)
- Cambic horizon—the zone from 4 to 60 inches (Bw1 and Bw2 horizons)

78—Talos-Basso complex, 0 to 4 percent slopes

Map Unit Setting

Landform(s): Alluvial flats (fig. 103)
Elevation: 3,940 to 4,050 feet (1,200 to 1,235 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertiic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Talos and similar soils: 57 percent
Basso and similar soils: 33 percent
Minor components: 10 percent
  Copia and similar soils
  Flake and similar soils
  Hermes and similar soils
  Mcnew and similar soils

Description of the Talos Soil

*Taxonomic classification:* Fine, gypsic, thermic Calcic Argigypsids
*Geomorphic position:* Alluvial flats
*Parent material:* Clayey alluvium
*Slope:* 0 to 4 percent
*Surface cover*
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—1 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
*Physical cover:*
  canopy plant cover—55 percent
  woody debris—12 percent
bare soil—40 percent
rock fragments—0 percent

Drainage class: Well drained

$K_{sat}$ (solum): 0.06 inch to 19.98 inches per hour (0.42 micrometer to 141.00 micrometers per second)

Available water capacity (total inches): 10.5 (very high)

Shrink-swell potential: About 7.2 LEP (high)

Flooding hazard: None

Runoff class: Medium

Hydrologic group: C

Ecological site name: Clayey

Ecological site number: R042XB023NM

Present vegetation: Tobosa, alkali sacaton, burrograss, and fourwing saltbush

Land capability classification (nonirrigated areas): 7c

**Typical Pedon** (fig. 104)

Location by Geographic Coordinate System: lat. 32 degrees 29 minutes 31.50 seconds N. and long. 106 degrees 20 minutes 0.70 second W.

A—0 to 1 inch (0 to 2 centimeters); brown (7.5YR 5/3) sandy loam, brown (7.5YR 4/3) moist; 17 percent clay; weak thin platy structure; slightly hard, friable, nonsticky, nonplastic; common fine dendritic tubular pores; finely disseminated carbonate throughout; slightly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; sodium adsorption ratio of 1.0; abrupt wavy boundary.

Bw—1 to 7 inches (2 to 18 centimeters); brown (7.5YR 5/4) clay loam, dark brown (7.5YR 3/4) moist; 34 percent clay; moderate fine and medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; common fine roots between peds; common fine and medium dendritic tubular pores; few fine spherical carbonate masses throughout; slightly effervescent, 5 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; sodium adsorption ratio of 1.0; clear wavy boundary.

Btk1—7 to 14 inches (18 to 36 centimeters); brown (7.5YR 5/4) clay, brown (7.5YR 4/4) moist; 45 percent clay; moderate very coarse prismatic structure parting to strong medium subangular blocky; moderately hard, firm, moderately sticky, moderately plastic; common fine roots between peds; common fine and medium dendritic tubular pores; few faint clay films on all faces of peds; common fine spherical carbonate masses throughout; strongly effervescent, 15 percent calcium carbonate equivalent; slightly alkaline, pH 7.5; electrical conductivity of 2.0 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; clear wavy boundary.

Btk2—14 to 21 inches (36 to 53 centimeters); reddish brown (5YR 5/3) clay, reddish brown (5YR 4/4) moist; 50 percent clay; strong very coarse prismatic structure parting to strong fine and medium subangular blocky; moderately hard, firm, moderately sticky, moderately plastic; common fine roots between peds; common very fine and fine dendritic tubular pores; few faint clay films on all faces of peds; common fine spherical carbonate masses throughout; strongly effervescent, 15 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 3.3 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; abrupt wavy boundary.

Bty1—21 to 32 inches (53 to 81 centimeters); light brown (7.5YR 6/4) gysiferous clay loam, brown (7.5YR 4/4) moist; 38 percent clay; strong very coarse prismatic
structure parting to strong medium subangular blocky; moderately hard, firm, moderately sticky, moderately plastic; common fine roots between peds; few faint clay films on all faces of peds and common prominent gypsum coats on vertical faces of peds; finely disseminated carbonate throughout, common fine platy selenite crystals between peds, and many very coarse irregular gypsum masses in matrix; slightly effervescent, 5 percent calcium carbonate equivalent and 25 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 4.0; clear wavy boundary.

Figure 104.—Representative profile of the Talos soil in map unit 78 (Talos-Basso complex, 0 to 4 percent slopes). Scale is in centimeters.
Bty2—32 to 51 inches (81 to 130 centimeters); reddish brown (5YR 5/4) gypsiferous clay, reddish brown (5YR 4/4) moist; 55 percent clay; strong very coarse prismatic structure parting to strong medium prismatic parting to strong fine and medium subangular blocky; moderately hard, firm, moderately sticky, moderately plastic; common fine roots between peds; few prominent clay films on all faces of peds and few prominent gypsum coats on vertical faces of peds; finely disseminated carbonate throughout, common fine medium and coarse platy selenite crystals between peds, and common medium irregular gypsum masses between peds; slightly effervescent, 4 percent calcium carbonate equivalent and 16 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 5.9 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 8.0; clear wavy boundary.

2Bty—51 to 59 inches (130 to 150 centimeters); reddish brown (5YR 5/4) sandy clay loam, yellowish red (5YR 4/6) moist; 34 percent clay; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common fine roots between peds; few faint clay films on surfaces along pores; finely disseminated carbonate throughout and common fine irregular gypsum crystals in matrix; slightly effervescent, 4 percent calcium carbonate equivalent and 12 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 5.5 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 8.0; abrupt wavy boundary.

3Cy—59 to 71 inches (150 to 180 centimeters); pale brown (10YR 6/3) sand, brown (7.5YR 4/4) moist; single grain; loose, loose, nonsticky, nonplastic; finely disseminated gypsum throughout; noneffervescent, 1 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 4.3 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 5.0.

**Range in Characteristics**

*Clay content of control section (weighted average):* 38 to 56 percent

**A horizon:**
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy loam or clay loam
- Clay content—10 to 30 percent

**Bw horizon:**
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—clay loam or clay
- Clay content—34 to 45 percent

**Btk horizons:**
- Hue—5YR or 7.5YR
- Value—4 to 6 dry; 4 to 5 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy clay or clay
- Clay content—40 to 60 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline to slightly saline
- Calcium carbonate equivalent—15 to 25 percent

**Bty horizons:**
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
Chroma—3 to 6, dry or moist  
Texture—gypsiferous clay loam or gypsiferous clay  
Clay content—27 to 60 percent  
Reaction—slightly alkaline or moderately alkaline  
Salinity—very slightly saline or slightly saline  
Gypsum content—15 to 37 percent

**2Bty horizon (if it occurs):**  
Hue—5YR or 7.5YR  
Value—5 to 6 dry; 4 to 5 moist  
Chroma—3 to 6, dry or moist  
Texture—sandy clay loam or sandy clay  
Clay content—18 to 40 percent  
Reaction—slightly alkaline or moderately alkaline  
Salinity—very slightly saline or slightly saline  
Gypsum content—12 to 31 percent

**3Cy horizon:**  
Hue—7.5YR or 10YR  
Value—4 to 7 dry; 3 to 6 moist  
Chroma—3 to 4, dry or moist  
Texture—sand, fine sand, or loamy fine sand  
Salinity—very slightly saline or slightly saline  
Gypsum content—1 to 5 percent

**Diagnostic Features**  
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizon)  
- Argillic horizon—the zone from 7 to 59 inches (Btk1, Btk2, Bty1, Bty2, and 2Bty horizons)  
- Calcic horizon—the zone from 7 to 21 inches (Btk1 and Btk2 horizons)  
- Gypsic horizon—the zone from 21 to 59 inches (Bty1, Bty2, and 2Bty horizons)

**Description of the Basso Soil**

*Taxonomic classification:* Fine-loamy, gypsic, thermic Typic Argigypsids  
*Geomorphic position:* Alluvial flats  
*Parent material:* Fine-loamy alluvium  
*Slope:* 0 to 4 percent  
**Surface cover**  
- Biological crust:  
  - cyanobacteria—0 percent  
  - lichen—0 percent  
  - moss—0 percent  
  - cryptogamic crust—5 percent
  
- Chemical crust:  
  - salt—0 percent  
  - gypsum—0 percent
  
- Physical cover:  
  - canopy plant cover—30 percent  
  - woody debris—15 percent  
  - bare soil—50 percent  
  - rock fragments—0 percent

*Drainage class:* Well drained  
*K*₅₉₆ (solum): 0.06 inch to 1.98 inches per hour (0.42 micrometer to 14.00 micrometers per second)  
*Available water capacity (total inches):* 10.1 (very high)  
*Shrink-swell potential:* About 4.1 LEP (moderate)
Flooding hazard: None
Runoff class: Low
Hydrologic group: C
Ecological site name: Loamy
Ecological site number: R042XB014NM
Present vegetation: Honey mesquite, cactus, burrograss, and fourwing saltbush
Land capability classification (nonirrigated areas): 7c

**Typical Pedon** (fig. 105)

*Location by Geographic Coordinate System:* lat. 32 degrees 28 minutes 10.70 seconds N. and long. 106 degrees 21 minutes 6.20 seconds W.

A—0 to 2 inches (0 to 5 centimeters); light brown (7.5YR 6/3) sandy clay loam, brown (7.5YR 4/3) moist; 22 percent clay; moderate thick platy over moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly
plastic; common very fine and fine roots between peds; few medium and common fine dendritic tubular pores; finely disseminated carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 1.2 dS/m (mmhos/cm); nonsaline; sodium adsorption ratio of 1.0; clear wavy boundary.

Bw—2 to 8 inches (5 to 20 centimeters); light brown (7.5YR 6/4) loam, brown (7.5YR 5/3) moist; 24 percent clay; moderate coarse parting to moderate medium parting to moderate fine subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few fine and medium roots between peds; common fine dendritic tubular pores; finely disseminated carbonate throughout; strongly effervescent, 11 percent calcium carbonate equivalent; slightly alkaline, pH 7.8; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; sodium adsorption ratio of 1.0; gradual wavy boundary.

Bk—8 to 13 inches (20 to 33 centimeters); light brown (7.5YR 6/3) clay loam, brown (7.5YR 5/4) moist; 28 percent clay; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few fine and medium roots between peds; common fine dendritic tubular pores; common fine spherical carbonate masses throughout; strongly effervescent, 11 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 2.8 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; clear wavy boundary.

Btk—13 to 18 inches (33 to 46 centimeters); reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/4) moist; 33 percent clay; weak very coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots and fine roots between peds; few fine dendritic tubular pores; few distinct clay films on all faces of peds; finely disseminated gypsum throughout and common fine and medium irregular carbonate masses on faces of peds; strongly effervescent, 9 percent calcium carbonate equivalent and 3 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 3.5 dS/m (mmhos/cm); very slightly saline; sodium adsorption ratio of 1.0; gradual wavy boundary.

Btky1—18 to 34 inches (46 to 86 centimeters); pink (7.5YR 7/4) gypsiferous sandy clay loam, light brown (7.5YR 6/4) moist; 32 percent clay; weak very coarse prismatic structure parting to moderate coarse subangular blocky parting to moderate medium subangular blocky; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots throughout and common fine roots between peds; few fine dendritic tubular pores; few faint clay films on all faces of peds; common fine irregular carbonate masses and many fine spherical gypsum crystals throughout; violently effervescent, 15 percent calcium carbonate equivalent and 27 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 3.0; gradual wavy boundary.

Btky2—34 to 44 inches (86 to 112 centimeters); pink (7.5YR 7/3) clay loam, light brown (7.5YR 6/4) moist; 38 percent clay; weak very coarse prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots throughout and common fine roots between peds; few fine dendritic tubular pores; few faint clay films on surfaces along pores; many medium spherical gypsum crystals and common medium irregular carbonate masses on faces of peds; violently effervescent, 34 percent calcium carbonate equivalent and 13 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 7.5 dS/m (mmhos/cm); slightly saline; sodium adsorption ratio of 10.0; gradual wavy boundary.

Btkyz—44 to 60 inches (112 to 152 centimeters); pink (7.5YR 7/3) gypsiferous clay, light brown (7.5YR 6/4) moist; 40 percent clay; weak very coarse prismatic structure parting to moderate medium subangular blocky parting to moderate
fine subangular blocky; slightly hard, friable, nonsticky, nonplastic; few very fine roots throughout and common fine roots between peds; few fine dendritic tubular pores; few prominent reddish brown (5YR 4/4) clay films on all faces of peds; many medium spherical gypsum crystals on faces of peds and many coarse irregular carbonate masses on faces of peds; violently effervescent, 43 percent calcium carbonate equivalent and 21 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 8.4 dS/m (mmhos/cm); moderately saline; sodium adsorption ratio of 14.0.

**Range in Characteristics**

*Clay content of control section (weighted average): 18 to 35 percent*

**A horizon:**
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam, fine sandy loam, or sandy clay loam
- Clay content—8 to 27 percent
- Reaction—slightly alkaline or moderately alkaline

**Bw horizon:**
- Hue—7.5YR or 10YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—loam or clay loam
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline

**Bk horizon:**
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 4 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—clay loam or sandy clay
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline
- Calcium carbonate equivalent—5 to 15 percent

**Btk horizon:**
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—loam or sandy clay loam
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline
- Calcium carbonate equivalent—5 to 15 percent

**Btky and Btkyz horizons:**
- Hue—5YR to 10YR
- Value—5 to 8 dry; 4 to 7 moist
- Chroma—1 to 4, dry or moist
- Texture—gypsiferous sandy clay loam, clay loam, gypsiferous clay loam, or gypsiferous clay
- Clay content—20 to 60 percent
- Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline to strongly saline
Calcium carbonate equivalent—15 to 45 percent
Gypsum content—13 to 30 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 2 to 8 inches (Bw horizon)
- Argillic horizon—the zone from 13 to 34 inches (Btk and Btky1 horizons)
- Gypsic horizon—the zone from 18 to 42 inches (Btky1, Btky2, and Btkyz horizons)

**79—Talos-Copia-Mcnew complex, 1 to 10 percent slopes**

**Map Unit Setting**

*Landform(s):* Alluvial flats (fig. 106)
*Elevation:* 3,940 to 4,080 feet (1,200 to 1,245 meters)
*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)
*Mean annual air temperature:* 64 to 70 degrees F (18.0 to 21.0 degrees C)
*Mean annual soil temperature:* 66 to 72 degrees F (19.1 to 22.1 degrees C)
*Frost-free period:* 180 to 240 days

*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains
*Land Resource Unit:* 42-2 Chihuahuan Desert Shrub

**Map Unit Composition**

Talos and similar soils: 40 percent
Copia and similar soils: 20 percent
Mcnew and similar soils: 20 percent
Minor components: 20 percent
- Basso and similar soils
- Flake and similar soils
- Hermes and similar soils
Loki and similar soils
Pajarito and similar soils
Peligro and similar soils

**Description of the Talos Soil**

*Taxonomic classification:* Fine, gypsic, thermic Typic Argigypsids

*Geomorphic position:* Deflated interdunes

*Parent material:* Clayey alluvium

*Slope:* 1 to 3 percent

**Surface cover**

- **Biological crust:**
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—3 percent

- **Chemical crust:**
  - salt—0 percent
  - gypsum—0 percent

- **Physical cover:**
  - canopy plant cover—40 percent
  - woody debris—10 percent
  - bare soil—70 percent
  - rock fragments—0 percent

*Drainage class:* Well drained

*K*<sub>sat</sub> (*solum*): 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

*Available water capacity (total inches):* 9.2 (high)

*Shrink-swell potential:* About 6.0 LEP (high)

*Flooding hazard:* None

*Runoff class:* Low

*Hydrologic group:* C

*Ecological site name:* Clayey

*Ecological site number:* R042XB023NM

*Present vegetation:* Broom snakeweed, fourwing saltbush, and honey mesquite

*Land capability classification (nonirrigated areas):* 7c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 32 degrees 29 minutes 24.00 seconds N. and long. 106 degrees 17 minutes 29.00 seconds W.

A—0 to 2 inches (0 to 5 centimeters); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; 16 percent clay; weak medium platy over weak fine granular structure; soft, friable, nonsticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk—2 to 6 inches (5 to 15 centimeters); light brown (7.5YR 6/4) clay loam, strong brown (7.5YR 5/4) moist; 30 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; common fine irregular carbonate masses throughout; violently effervescent, 8 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.8 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Btky—6 to 10 inches (15 to 25 centimeters); pink (7.5YR 7/4) gypsiferous clay loam, brown (7.5YR 5/4) moist; 36 percent clay; moderate coarse subangular blocky
structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few fine dendritic tubular pores; few faint clay films on all faces of peds; common fine and many medium irregular gypsum masses throughout; violently effervescent, 15 percent calcium carbonate equivalent and 21 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 2.0 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Bty1—10 to 23.5 inches (25 to 60 centimeters); light brown (7.5YR 6/4) gypsiferous clay, brown (7.5YR 5/4) moist; 45 percent clay; moderate coarse subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; few prominent clay films on all faces of peds; finely disseminated carbonate and common medium irregular selenite crystals between peds and many medium irregular gypsum masses throughout; strongly effervescent, 3 percent calcium carbonate equivalent and 21 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 4.0 dS/m (mmhos/cm); slightly saline; gradual wavy boundary.

Bty2—23.5 to 40 inches (60 to 101 centimeters); light brown (7.5YR 6/3) gypsiferous clay, strong brown (7.5YR 5/6) moist; 50 percent clay; moderate medium subangular blocky structure; moderately hard, firm, moderately sticky, moderately plastic; few prominent clay films on all faces of peds; finely disseminated carbonate and common medium irregular gypsum masses throughout; strongly effervescent, 4 percent calcium carbonate equivalent and 22 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 6.4 dS/m (mmhos/cm); slightly saline; gradual wavy boundary.

Bty3—40 to 60 inches (101 to 152 centimeters); light brown (7.5YR 6/4) gypsiferous clay, brown (7.5YR 5/4) moist; 60 percent clay; moderate medium subangular blocky structure; hard, very firm, very sticky, very plastic; few faint clay films on all faces of peds; finely disseminated carbonate and common medium irregular gypsum masses throughout; strongly effervescent, 9 percent calcium carbonate equivalent and 32 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 7.0 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Note: The Talos soil in this map unit is considered a taxadjunct to the series because the calcic horizon begins at the same depth as the gypsic horizon.

Clay content of control section (weighted average): 35 to 60 percent

A horizon:
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—sandy loam, loam, or silt loam
- Clay content—15 to 25 percent
- Reaction—slightly alkaline or moderately alkaline

Bk horizon:
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 3 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—clay loam or clay
- Clay content—30 to 45 percent
- Calcium carbonate equivalent—8 to 20 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—nonsaline or very slightly saline


_Btky horizon:_
- Hue—5YR or 7.5YR
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—3 to 6, dry or moist
- Texture—gypsiferous clay loam or gypsiferous clay
- Clay content—30 to 50 percent
- Calcium carbonate equivalent—15 to 25 percent
- Gypsum content—15 to 25 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline

_Bty horizons:_
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—3 to 6, dry or moist
- Clay content—45 to 60 percent
- Gypsum content—15 to 35 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—very slightly saline or slightly saline

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 6 inches (A and Bk horizons)
- Cambic horizon—the zone from 2 to 6 inches (Bk horizon)
- Argillic horizon—the zone from 6 to 60 inches (Btky, Bty1, Bty2, and Bty3 horizons)
- Calcic horizon—the zone from 6 to 10 inches (Btky horizon)
- Gypsic horizon—the zone from 6 to 60 inches (Btky, Bty1, Bty2, and Bty3 horizons)

**Description of the Copia Soil**

_Taxonomic classification:_ Mixed, thermic Typic Torripsamments
_Geomorphic position:_ Isolated shrub-coppice dunes
_Parent material:_ Eolian sands
_Slope:_ 1 to 10 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

**Physical cover**:
- canopy plant cover—50 percent
- woody debris—20 percent
- bare soil—60 percent
- rock fragments—0 percent

_Drainage class:_ Excessively drained

\[ K_{sat} \text{(solum)}: 19.98 \text{ to } 99.92 \text{ inches per hour (141.00 to 705.00 micrometers per second)} \]

_Available water capacity (total inches): 6.0 (moderate)  
Shrink-swell potential: About 0.4 LEP (low)  
Flooding hazard: None  
Runoff class: Negligible  
Hydrologic group: A  
Ecological site name: Deep Sand_
Ecological site number: R042XB011NM
Present vegetation: Fourwing saltbush, honey mesquite, bush milihly, and western tansymustard
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 36 minutes 59.19 seconds N. and long. 106 degrees 17 minutes 42.00 seconds W.

C—0 to 60 inches (0 to 152 centimeters); brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; 5 percent clay; single grain; loose, loose, nonsticky, nonplastic; common medium and few fine roots throughout; many fine interstitial pores; noneffervescent; slightly alkaline, pH 7.6; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 5 percent

C horizon:
Hue—5YR or 7.5YR
Value—5 to 6 dry; 4 to 5 moist
Chroma—3 to 6, dry or moist
Texture—sand, loamy sand, or loamy fine sand
Clay content—0 to 5 percent

Description of the Mcnew Soil

Taxonomic classification: Fine-loamy, mixed, superactive, thermic Typic Calciargids
Geomorphic position: Interdunes
Parent material: Fine-loamy alluvium
Slope: 1 to 3 percent
Surface cover
Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
  cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—45 percent
  woody debris—5 percent
  bare soil—75 percent
  rock fragments—25 percent gravel
Drainage class: Well drained
$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
Available water capacity (total inches): 10.2 (very high)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Runoff class: Low
Hydrologic group: B
Ecological site name: Loamy
Ecological site number: R042XB014NM
Present vegetation: Broom snakeweed and fourwing saltbush
Land capability classification (nonirrigated areas): 7c
Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 25 minutes 54.30 seconds N. and long. 106 degrees 17 minutes 26.30 seconds W.

A—0 to 4 inches (0 to 10 centimeters); strong brown (7.5YR 5/6) sandy loam, strong brown (7.5YR 4/6) moist; 8 percent clay; weak thin platy over weak fine granular structure; soft, very friable, nonsticky, nonplastic; few medium roots throughout; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.4 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Btk1—4 to 14 inches (10 to 35 centimeters); strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 4/6) moist; 25 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine and medium roots throughout; few fine dendritic tubular pores; few faint clay films on all faces of peds; common medium irregular carbonate masses throughout; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Btk2—14 to 29.5 inches (35 to 75 centimeters); pink (7.5YR 7/4) sandy clay loam, light brown (7.5YR 6/4) moist; 30 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine and medium roots throughout; few fine and medium dendritic tubular pores; few faint clay films on all faces of peds; many medium irregular carbonate masses throughout; violently effervescent, 16 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk1—29.5 to 47 inches (75 to 120 centimeters); pink (7.5YR 7/4) sandy clay loam, light brown (7.5YR 6/4) moist; 32 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky, slightly plastic; many medium irregular carbonate masses throughout; violently effervescent, 35 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 3.9 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.

Bk2—47 to 60 inches (120 to 152 centimeters); brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; 30 percent clay; moderate medium subangular blocky structure; hard, very firm, slightly sticky, slightly plastic; common fine irregular carbonate masses throughout; violently effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; electrical conductivity of 6.8 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 20 to 35 percent

A horizon:
- Hue—5YR or 7.5YR
- Value—5 to 6 dry; 4 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—sandy loam or sandy clay loam
- Clay content—8 to 25 percent

Btk horizons:
- Hue—5YR or 7.5YR
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—4 to 6, dry or moist
- Texture—sandy clay loam or clay loam
Clay content—20 to 35 percent
Calcium carbonate equivalent—15 to 25 percent
Salinity—nonsaline or very slightly saline

Bk horizons:
Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—4 to 6, dry or moist
Texture—sandy clay loam or clay loam
Clay content—25 to 35 percent
Calcium carbonate equivalent—10 to 40 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—very slightly saline or slightly saline

Diagnostic Features
• Ochric epipedon—the zone from 0 to 4 inches (A horizon)
• Argillic horizon—the zone from 4 to 29.5 inches (Btk1 and Btk2 horizons)
• Calcic horizon—the zone from 4 to 47 inches (Btk1, Btk2, and Bk1 horizons)

80—Tanbark-Winona-Tulargo complex, 0 to 60 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts and hills (fig. 107)
Elevation: 4,920 to 7,970 feet (1,501 to 2,429 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 120 to 180 days
Major Land Resource Area: 70C—Central New Mexico Highlands
Land Resource Unit: 70C.1 Central New Mexico Highlands
Map Unit Composition

Tanbark and similar soils: 40 percent
Winona and similar soils: 35 percent
Tulargo and similar soils: 20 percent
Minor components: 5 percent
    Cuate and similar soils
    Deama and similar soils
    La Fonda and similar soils

Description of the Tanbark Soil

**Taxonomic classification:** Loamy, hypergypsic, mesic Lithic Haplogypsids
**Geomorphic position:** All positions of gypsum bedrock hills
**Parent material:** Gypsiferous alluvium derived from rock gypsum
**Slope:** 5 to 60 percent

**Surface cover**
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—10 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—5 percent
- Physical cover:
  - canopy plant cover—20 percent
  - woody debris—5 percent
  - bare soil—40 percent
  - rock fragments—25 percent gravel and 10 percent cobbles

**Depth to restrictive feature(s):** 4 to 8 inches to lithic bedrock
**Drainage class:** Well drained
**$K_{sat}$ (solum):** 0.20 to 0.57 inch per hour (1.40 to 4.00 micrometers per second)
**$K_{sat}$ (restrictive layer):** 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)
**Available water capacity (total inches):** 1.0 (very low)
**Shrink-swell potential:** About 1.5 LEP (low)
**Flooding hazard:** None
**Runoff class:** High
**Hydrologic group:** D
**Ecological site name:** Gyp Hills
**Ecological site number:** R070CY124NM
**Present vegetation:** Gyp grama, hairy coldenia, and oneseed juniper
**Land capability classification (nonirrigated areas):** 6c

Typical Pedon (fig. 108)

**Location by Geographic Coordinate System:** lat. 33 degrees 16 minutes 25.20 seconds N. and long. 106 degrees 41 minutes 39.90 seconds W.

Ay—0 to 4 inches (0 to 10 centimeters); light brown (7.5YR 6/4) gypsiferous loam, brown (7.5YR 5/4) moist; 20 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; few very fine and fine dendritic tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; strongly effervescent, 8 percent calcium carbonate equivalent and 45 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 2.1 dS/m (mmhos/cm); very slightly saline; clear smooth boundary.
Byy—4 to 6.5 inches (10 to 16 centimeters); pinkish gray (7.5YR 7/2) gypsiferous loam, light brown (7.5YR 6/3) moist; 18 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine and fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate and many very fine irregular gypsum crystals throughout; violently effervescent, 12 percent calcium carbonate equivalent and 73 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 3.4 dS/m (mmhos/cm); very slightly saline; very abrupt smooth boundary.

R—6.5 inches (16 centimeters); unweathered, unfractured, and indurated gypsum.

**Range in Characteristics**

*Clay content of control section (weighted average):* 15 to 27 percent

**Ay horizon:**
- Hue—7.5YR or 10YR
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—2 to 4, dry or moist
- Texture—gypsiferous sandy loam or gypsiferous loam
- Clay content—15 to 27 percent
- Gypsum content—15 to 80 percent

**Byy horizon:**
- Hue—7.5YR or 10YR
- Value—6 to 8 dry; 5 to 7 moist
- Chroma—2 to 4, dry or moist
- Texture—gypsiferous loam or gypsiferous silt loam
- Clay content—15 to 27 percent
- Gypsum content—40 to 80 percent
Diagnostic Features

- Ochric epipedon—the zone from 0 to 4 inches (Ay horizon)
- Gypsic horizon—the zone from 0 to 6.5 inches (Ay and Byy horizons)
- Depth to lithic contact—6.5 inches (R horizon)

Description of the Winona Soil

**Taxonomic classification:** Loamy-skeletal, carbonatic, mesic Lithic Ustic Haplocalcids

**Geomorphic position:** All positions of limestone dipslope hills

**Parent material:** Gravelly alluvium derived from limestone

**Slope:** 2 to 35 percent

**Surface cover**

- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent

- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent

- Physical cover:
  - canopy plant cover—45 percent
  - woody debris—10 percent
  - bare soil—15 percent
  - rock fragments—60 percent gravel and 10 percent cobbles

**Depth to restrictive feature(s):** 16 to 20 inches to lithic bedrock

**Drainage class:** Moderately well drained

- $K_{sat}$ (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)
- $K_{sat}$ (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

**Available water capacity (total inches):** 1.4 (very low)

**Shrink-swell potential:** About 0.8 LEP (low)

**Flooding hazard:** None

**Runoff class:** High

**Hydrologic group:** D

**Ecological site name:** Limestone Hills

**Ecological site number:** R070CY107NM

**Present vegetation:** Banana yucca, blue grama, galleta, Mormon tea, mountain mahogany, oneseed juniper, pinyon, sideoats grama, and winterfat

**Land capability classification (nonirrigated areas):** 6c

Typical Pedon

**Location by Geographic Coordinate System:** lat. 33 degrees 16 minutes 37.20 seconds N. and long. 106 degrees 41 minutes 22.60 seconds W.

A—0 to 2 inches (0 to 5 centimeters); grayish brown (10YR 5/2) gravelly sandy loam, dark brown (10YR 3/3) moist; 11 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate throughout; 25 percent gravel and 5 percent cobbles; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 1.0 DS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk—2 to 8.5 inches (5 to 22 centimeters); brown (7.5YR 5/2) very gravelly sandy loam, brown (7.5YR 4/2) moist; 13 percent clay; weak fine subangular blocky structure; soft, friable, slightly sticky, nonplastic; few fine and medium roots throughout; common very fine dendritic tubular pores; common fine irregular
carbonate masses throughout; 35 percent gravel and 5 percent cobbles; violently
effervescent, 27 percent calcium carbonate equivalent; moderately alkaline,
pH 8.3; electrical conductivity of 1.6 dS/m (mmhos/cm); nonsaline; clear wavy
boundary.
Bkk—8.5 to 19 inches (22 to 48 centimeters); white (7.5YR 8/1) very cobbly sandy
loam, pinkish gray (7.5YR 6/2) moist; 7 percent clay; weak medium subangular
blocky structure; hard, very firm, slightly sticky, nonplastic; few very fine, fine,
and medium roots throughout; few very fine dendritic tubular pores; many coarse
irregular carbonate masses throughout; 20 percent gravel, 10 percent cobbles,
and 5 percent stones; violently effervescent, 45 percent calcium carbonate
equivalent; moderately alkaline, pH 7.9; electrical conductivity of 1.9 dS/m
(mmhos/cm); nonsaline; abrupt smooth boundary.
R—19 inches (48 centimeters); unweathered, unfractured, and indurated limestone.

Range in Characteristics

Note: The Winona soil in this survey area is considered a taxadjunct to the series
because the pedon does not have carbonatic mineralogy and does not meet the clay
requirement of the Winona series.

Clay content of control section (weighted average): 5 to 18 percent
Rock fragment content in control section: 35 to 60 percent

A horizon:
Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—coarse sandy loam, sandy loam, or loam
Clay content—5 to 18 percent
Rock fragment content—15 to 45 percent

Bk horizon:
Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—coarse sandy loam, sandy loam, or loam
Clay content—5 to 18 percent
Rock fragment content—35 to 60 percent
Calcium carbonate equivalent—15 to 40 percent

Bkk horizon:
Hue—7.5YR or 10YR
Value—5 to 8 dry; 4 to 7 moist
Chroma—1 to 4, dry or moist
Texture—coarse sandy loam, sandy loam, or loam
Clay content—5 to 18 percent
Rock fragment content—20 to 60 percent
Calcium carbonate equivalent—40 to 60 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 2 inches (A horizon)
• Calcic horizon—the zone from 2 to 19 inches (Bk and Bkk horizons)
• Depth to lithic contact—19 inches (R horizon)

Description of the Tulargo Soil

Taxonomic classification: Fine-loamy, gypsic, mesic Ustic Calcgypsids
Geomorphic position: Fan piedmonts adjacent to gypsiferous rock outcrop
Parent material: Alluvium derived from rock gypsum and/or alluvium derived from limestone

Slope: 0 to 10 percent

Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—65 percent
- woody debris—15 percent
- bare soil—25 percent
- rock fragments—10 percent gravel and 1 percent cobbles

Drainage class: Well drained

K sat (solum): 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)

Available water capacity (total inches): 9.0 (high)

Shrink-swell potential: About 2.4 LEP (low)

Flooding hazard: None

Runoff class: Medium

Hydrologic group: B

Ecological site name: Loamy

Ecological site number: R070CY109NM

Present vegetation: Black grama, fourwing saltbush, oneseed juniper, soaptree yucca, and sotol

Land capability classification (nonirrigated areas): 6c

Typical Pedon (fig. 109)

Location by Geographic Coordinate System: lat. 33 degrees 16 minutes 28.00 seconds N. and long. 106 degrees 41 minutes 26.60 seconds W.

A—0 to 2.5 inches (0 to 6 centimeters); brown (7.5YR 5/3) sandy loam, brown (7.5YR 4/3) moist; 15 percent clay; moderate medium platy structure; soft, very friable, slightly sticky, nonplastic; few medium and coarse and common very fine and fine roots throughout; few very fine and fine dendritic tubular pores; finely disseminated carbonate throughout; 5 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.

Bk1—2.5 to 12 inches (6 to 30 centimeters); brown (7.5YR 5/3) loam, brown (7.5YR 4/3) moist; 22 percent clay; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium and few very fine, fine, and coarse roots throughout; few very fine, fine, and medium dendritic tubular pores; few distinct carbonate coats on rock fragments; 5 percent gravel; violently effervescent, 17 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 1.3 dS/m (mmhos/cm); nonsaline; gradual smooth boundary.

Bk2—12 to 29 inches (30 to 74 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 22 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots throughout; few very fine and medium and common fine dendritic tubular pores; few distinct carbonate coats on rock fragments; finely disseminated gyspum throughout; 11 percent gravel; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.
equivalent and 2 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 1.4 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bky1—29 to 37 inches (74 to 94 centimeters); light brown (7.5YR 6/4) gypsiferous gravelly loam, brown (7.5YR 5/4) moist; 25 percent clay; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few very fine and fine roots throughout; common medium and few very fine and fine dendritic tubular pores; few distinct carbonate coats on rock fragments; few fine irregular
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gypsum crystals throughout; 25 percent gravel; violently effervescent, 18 percent calcium carbonate equivalent and 16 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; gradual wavy boundary.

Bky2—37 to 57.5 inches (94 to 146 centimeters); brown (7.5YR 5/4) gypsiferous loam, brown (7.5YR 4/4) moist; 26 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; few very fine and fine roots throughout; common medium and few very fine, fine, and coarse dendritic tubular pores; few distinct carbonate coats on rock fragments; few fine irregular gypsum crystals throughout; 10 percent gravel; violently effervescent, 15 percent calcium carbonate equivalent and 16 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 2.7 dS/m (mmhos/cm); very slightly saline; clear wavy boundary.

Bky3—57.5 to 60 inches (146 to 152 centimeters); pink (7.5YR 7/3) gypsiferous gravelly loam, light brown (7.5YR 6/3) moist; 26 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine and few fine roots throughout; common very fine and few fine dendritic tubular pores; common fine and few medium irregular gypsum crystals and common fine irregular carbonate masses throughout; 20 percent gravel; violently effervescent, 18 percent calcium carbonate equivalent and 18 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 3.2 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Note: The Tulargo soil in this map unit is considered a taxadjunct to the Tulargo series because it has a calcic horizon and gypsic mineralogy.

Clay content of control section (weighted average): 10 to 27 percent; average of more than 18 percent

A horizon:
Hue—7.5YR or 10YR
Value—4 to 5 dry; 3 to 4 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—5 to 18 percent
Reaction—slightly alkaline or moderately alkaline

Bk horizons:
Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—loam or sandy clay loam
Clay content—10 to 27 percent
Rock fragment content—0 to 25 percent
Calcium carbonate equivalent—15 to 25 percent
Reaction—slightly alkaline or moderately alkaline

Bky horizons:
Hue—7.5YR or 10YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—4 to 6, dry or moist
Texture—gypsiferous loam or gypsiferous sandy clay loam
Clay content—10 to 27 percent
Rock fragment content—0 to 35 percent
Calcium carbonate equivalent—15 to 25 percent
Gypsum content—15 to 40 percent
Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 2.5 inches (A horizon)
- Calcic horizon—the zone from 2.5 to 60 inches (Bk1, Bk2, Bky1, Bky2, and Bky3 horizons)
- Gypsic horizon—the zone from 29 to 60 inches (Bky1, Bky2, and Bky3 horizons)

81—Terrier sandy clay loam, 0 to 4 percent slopes

Map Unit Setting

Landform(s): Drainageways (fig. 110)
Elevation: 3,980 to 4,220 feet (1,212 to 1,285 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Terrier and similar soils: 95 percent
Minor components: 5 percent
- Bigsalt and similar soils
- Gypsic Haplosalids and similar soils
- Water

Figure 110.—An area of map unit 81 (Terrier sandy clay loam, 0 to 4 percent slopes).
Description of the Terrier Soil

**Taxonomic classification:** Fine, gypsic, thermic Gypsic Aquisalids  
**Geomorphic position:** Stream terraces  
**Parent material:** Clayey alluvium  
**Slope:** 0 to 4 percent  
**Surface cover**  
- **Biological crust:**  
  - cyanobacteria—0 percent  
  - lichen—0 percent  
  - moss—0 percent  
  - cryptogamic crust—0 percent  
- **Chemical crust:**  
  - salt—60 percent  
  - gypsum—0 percent  
- **Physical cover:**  
  - canopy plant cover—15 percent  
  - woody debris—15 percent  
  - bare soil—25 percent  
  - rock fragments—0 percent  
**Depth to restrictive feature(s):** 0 to 2 inches to salic horizon  
**Drainage class:** Very poorly drained  
**K\text{sat} (solum):** 0.20 inch to 5.95 inches per hour (1.40 to 42.00 micrometers per second)  
**Available water capacity (total inches):** 0.0 (very low)  
**Shrink-swell potential:** About 3.3 LEP (moderate)  
**Flooding hazard:** Occasional  
**Depth to seasonal high water table (minimum):** About 0 to 40 inches  
**Runoff class:** Negligible  
**Hydrologic group:** C  
**Ecological site name:** Salt Meadow  
**Ecological site number:** R042XB028NM  
**Present vegetation:** Alkali sacaton, inland saltgrass, iodinebush, and saltcedar  
**Land capability classification (nonirrigated areas):** 7c  

**Typical Pedon** *(fig. 111)*  

**Location by Geographic Coordinate System:** lat. 33 degrees 17 minutes 48.60 seconds N. and long. 106 degrees 23 minutes 28.03 seconds W.  

Anyz—0 to 2 inches (0 to 5 centimeters); pale brown (10YR 6/3) gypsiferous sandy clay loam, dark yellowish brown (10YR 4/4) moist; 24 percent clay; weak thick platy structure; moderately hard, firm, slightly sticky, slightly plastic; common fine roots throughout; finely disseminated gypsum and carbonate and common very fine irregular salt crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 57 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 298.0 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.  

2Bnyyz—2 to 8 inches (5 to 20 centimeters); 30 percent light brown (7.5YR 6/3) and 70 percent very pale brown (10YR 8/2) gypsiferous sandy loam, 30 percent brown (7.5YR 5/4) and 70 percent very pale brown (10YR 7/3) moist; 14 percent clay; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common fine and medium roots throughout; few medium dendritic tubular pores; finely disseminated carbonate, many fine irregular gypsum crystals throughout, and common very fine irregular salt crystals on faces of peds; slightly effervescent, 3 percent calcium carbonate equivalent and 67 percent gypsum;
moderately alkaline, pH 8.4; electrical conductivity of 82.0 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

3Bnyz1—8 to 24 inches (20 to 61 centimeters); light brown (7.5YR 6/3) gypsiferous silty clay loam, brown (7.5YR 5/4) moist; 32 percent clay; moderate fine and medium subangular blocky structure; moderately hard, firm, very sticky, very plastic; common fine and medium roots throughout; common fine and medium dendritic tubular pores; 3 percent fine manganese masses throughout; finely disseminated carbonate, salt, and gypsum throughout; 3 percent gravel; violently effervescent, 36 percent calcium carbonate equivalent and 33 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 44.0 dS/m (mmhos/cm); strongly saline; abrupt wavy boundary.

3Bnyz2—24 to 60 inches (61 to 152 centimeters); 40 percent light gray (7.5YR 7/1) and 60 percent pinkish gray (7.5YR 6/2) gypsiferous silty clay, 40 percent gray (7.5YR 5/1) and 60 percent brown (7.5YR 5/3) moist; 45 percent clay; moderate fine and medium subangular blocky structure; hard, very firm, very sticky, very plastic; finely disseminated salt, carbonate, and gypsum throughout; violently effervescent, 21 percent calcium carbonate equivalent and 19 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 31.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

*Clay content of control section (weighted average): 30 to 45 percent*
**Anyz horizon:**
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 7 dry; 4 to 6 moist
- Chroma—3 to 4, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous silt loam, or gypsiferous sandy clay loam
- Clay content—12 to 35 percent
- Gypsum content—20 to 60 percent

**2Bnyyz horizon (if it occurs):**
- Hue—5YR, 7.5YR, or 10YR
- Value—5 to 8 dry; 4 to 7 moist
- Chroma—2 to 4, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous loam
- Clay content—10 to 20 percent
- Gypsum content—20 to 70 percent

**3Bnyz horizons:**
- Hue—7.5YR or 10YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—1 to 6, dry or moist
- Texture—gypsiferous silty clay loam, gypsiferous sandy clay, gypsiferous silty clay, or gypsiferous clay
- Clay content—32 to 60 percent
- Gypsum content—15 to 40 percent

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 2 inches (Anyz horizon)
- Gypsic horizon—the zone from 2 to 60 inches (2Bnyyz, 3Bnyz1, and 3Bnyz2 horizons)
- Salic horizon—the zone from 0 to 60 inches (Anyz, 2Bnyyz, 3Bnyz1, and 3Byz2 horizons)
- Endosaturation—the zone from 24 to 60 inches

**82—Transformer gypsiferous sand, 0 to 5 percent slopes**

**Map Unit Setting**

*Landform(s):* Playa steps

*Elevation:* 3,900 to 4,000 feet (1,190 to 1,220 meters)

*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)

*Mean annual air temperature:* 64 to 70 degrees F (18.0 to 21.0 degrees C)

*Mean annual soil temperature:* 66 to 72 degrees F (19.1 to 22.1 degrees C)

*Frost-free period:* 160 to 240 days

*Major Land Resource Area:* 42—Southern Desertic Basins, Plains, and Mountains

*Land Resource Unit:* 42-2 Chihuahuan Desert Shrub

**Map Unit Composition**

Transformer and similar soils: 98 percent

Minor components: 2 percent

Nasa and similar soils

**Description of the Transformer Soil**

*Taxonomic classification:* Hypergypsic, thermic Oxyaquic Torripsamments

*Geomorphic position:* Playa steps adjacent to gypsiferous-saline playas
Parent material: Gypiferous eolian sands
Slope: 0 to 5 percent
Surface cover
Biological crust:
  cyanobacteria—0 percent
  lichen—0 percent
  moss—0 percent
  cryptogamic crust—0 percent
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—5 percent
  woody debris—0 percent
  bare soil—98 percent
  rock fragments—0 percent
Drainage class: Somewhat poorly drained
\( K_{sat} \) (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)
Available water capacity (total inches): 3.0 (low)
Shrink-swell potential: About 0.6 LEP (low)
Flooding hazard: None
Depth to seasonal high water table (minimum): About 20 to 40 inches
Runoff class: Negligible
Hydrologic group: A
Ecological site name: Gyp Playa Step (shallow)
Ecological site number: R042XB029NM
Present vegetation: Iodinebush
Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 112)

Location by Geographic Coordinate System: lat. 32 degrees 59 minutes 52.50 seconds N. and long. 106 degrees 15 minutes 22.30 seconds W.

Cyyz1—0 to 24 inches (0 to 61 centimeters); white (10YR 9.5/1) gypiferous sand, white (10YR 9/1) moist; 1 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; many fine irregular gypsum crystals throughout; noneffervescent, 97 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 17.2 dS/m (mmhos/cm); strongly saline; diffuse wavy boundary.

Cyyz2—24 to 38 inches (61 to 97 centimeters); white (10YR 9.5/1) gypiferous fine sand, white (10YR 9/1) moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; many fine irregular gypsum crystals throughout; noneffervescent, 92 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 19.1 dS/m (mmhos/cm); strongly saline; diffuse wavy boundary.

Cyyz3—38 to 60 inches (97 to 152 centimeters); white (10YR 9.5/1) gypiferous fine sand, white (10YR 9/1) moist; 2 percent clay; massive; soft, very friable, nonsticky, nonplastic; many very fine irregular pores; many fine irregular gypsum crystals throughout; noneffervescent, 98 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 18.2 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Clay content of control section (weighted average): 0 to 5 percent
Other characteristics: Some pedons have a thin Ayyz horizon
Cyyz horizons:
- Hue—10YR or 2.5Y
- Value—8 to 9.5 dry; 7 to 9 moist
- Chroma—1 to 3, dry or moist
- Texture—gypsiferous sand, gypsiferous fine sand, or gypsiferous loamy sand
- Clay content—0 to 5 percent
- Reaction—slightly alkaline or moderately alkaline
- Gypsum content—90 to 100 percent

Diagnostic Features
- Endosaturation—the zone from 0 to 60 inches

83—Transformer-Lark association, 0 to 90 percent slopes, duneland

Map Unit Setting

Landform(s): Dunes and interdunes (fig. 113)
Elevation: 3,900 to 4,040 feet (1,190 to 1,230 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Transformer and similar soils: 65 percent
Lark, leeward and similar soils: 15 percent
Lark, windward and similar soils: 15 percent
Minor components: 5 percent
   Astrobee and similar soils
   Gyplaya and similar soils

Description of the Transformer Soil

Taxonomic classification: Hypergypsic, thermic Oxyaquic Torripsamments
Geomorphic position: Interdunes between widely scattered barchan dunes
Parent material: Gypsiferous eolian sands
Slope: 0 to 3 percent
Surface cover
   Biological crust:
      cyanobacteria—0 percent
      lichen—0 percent
      moss—0 percent
      cryptogamic crust—0 percent
   Chemical crust:
      salt—5 percent
      gypsum—0 percent
   Physical cover:
      canopy plant cover—2 percent
      woody debris—1 percent
      bare soil—93 percent
      rock fragments—0 percent

Figure 113.—An area of map unit 83 (Transformer-Lark association, 0 to 90 percent slopes, duneland).
**Drainage class**: Somewhat poorly drained

**Available water capacity (total inches)**: 4.2 (low)

**Shrink-swell potential**: About 0.5 LEP (low)

**Flooding hazard**: None

**Depth to seasonal high water table (minimum)**: About 0 to 40 inches

**Runoff class**: Negligible

**Hydrologic group**: A/D

**Ecological site name**: Gyp Interdune (Wet)

**Ecological site number**: R042XB004NM

**Present vegetation**: Alkali sacaton, iodinebush, and sand verbena

**Land capability classification (nonirrigated areas)**: 7c

**Typical Pedon**

**Location by Geographic Coordinate System**: lat. 32 degrees 53 minutes 20.00 seconds N. and long. 106 degrees 14 minutes 5.00 seconds W.

Cyyz1—0 to 9.5 inches (0 to 24 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine roots throughout; few fine irregular pores; many fine irregular gypsum crystals throughout; noneffervescent, 88 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 17.8 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cyyz2—9.5 to 39.5 inches (24 to 100 centimeters); white (10YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine roots throughout; few fine irregular pores; many fine irregular gypsum crystals throughout; noneffervescent, 93 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 22.3 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cyyz3—39.5 to 60 inches (100 to 152 centimeters); white (7.5YR 9.5/1) gypsiferous sand, white (10YR 9/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; few fine irregular pores; many fine irregular gypsum crystals throughout; noneffervescent, 91 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 23.9 dS/m (mmhos/cm); strongly saline.

**Range in Characteristics**

**Clay content of control section (weighted average)**: 0 to 5 percent

**Cyyz horizons**:

**Hue**—7.5YR, 10YR, or 2.5Y

**Value**—8 to 9.5 dry; 7 to 9 moist

**Chroma**—1 to 3, dry or moist

**Texture**—gypsiferous sand or gypsiferous fine sand

**Salinity**—moderately saline or strongly saline

**Gypsum content**—85 to 100 percent

**Diagnostic Features**

- Endosaturation—the zone from 9.5 to 60 inches

**Description of the Lark, Leeward Soil**

**Taxonomic classification**: Hypergypsic, thermic Typic Torripsamments

**Geomorphic position**: Leeward side of barchan dunes

**Parent material**: Gypsiferous eolian sands

**Slope**: 35 to 90 percent
Surface cover

Biological crust:
- cyanobacteria—0 percent
- lichen—0 percent
- moss—0 percent
- cryptogamic crust—0 percent

Chemical crust:
- salt—0 percent
- gypsum—0 percent

Physical cover:
- canopy plant cover—0 percent
- woody debris—0 percent
- bare soil—100 percent
- rock fragments—0 percent

Drainage class: Excessively drained

$K_{sat}$ (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)

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

Shrink-swell potential: About 0.5 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: A

Ecological site name: Gyp Duneland Barren

Ecological site number: R042XB002NM

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 32.10 seconds N. and long. 106 degrees 14 minutes 22.00 seconds W.

Cyy—0 to 61 inches (0 to 155 centimeters); white (2.5YR 8/1) gypsiferous sand, white (2.5YR 8/1) moist; 1 percent clay; single grain; loose, loose, nonsticky, nonplastic; many fine interstitial pores; many medium irregular gypsum crystals throughout; noneffervescent, 95 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 3.1 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics

Note: This component consists of unstabilized mounds, ridges, banks, or hills of loose eolian materials (typically sands) that are usually devoid of vegetation and capable of movement from place to place.

Clay content of control section (weighted average): 0 to 5 percent

Cyy horizon:
- Hue—10YR or 2.5Y
- Value—8 to 9.5 dry; 7 to 9 moist
- Chroma—1 to 2, dry or moist
- Texture—gypsiferous sand or gypsiferous fine sand
- Gypsum content—90 to 100 percent
- Reaction—slightly alkaline or moderately alkaline

Description of the Lark, Windward Soil

Taxonomic classification: Hypergypsic, thermic Typic Torripsamments

Geomorphic position: Windward side of barchan dunes

Parent material: Gypsiferous eolian sands

Slope: 3 to 30 percent
Surface cover
   Biological crust:
      cyanobacteria—0 percent
      lichen—0 percent
      moss—0 percent
      cryptogamic crust—0 percent
   Chemical crust:
      salt—0 percent
      gypsum—0 percent
   Physical cover:
      canopy plant cover—0 percent
      woody debris—0 percent
      bare soil—100 percent
      rock fragments—0 percent
Drainage class: Excessively drained
   $K_{sat}$ (solum): 19.98 to 99.92 inches per hour (141.00 to 705.00 micrometers per second)
Available water capacity (total inches): 4.4 (low)
Shrink-swell potential: About 0.5 LEP (low)
Flooding hazard: None
Runoff class: Very low
Hydrologic group: A
Ecological site name: Gyp Duneland Barren
Ecological site number: R042XB002NM
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 20.70 seconds N. and long. 106 degrees 14 minutes 22.30 seconds W.

Cyy1—0 to 10 inches (0 to 25 centimeters); white (2.5YR 8.5/1) gypsiferous sand, white (2.5YR 8/1) moist; 1 percent clay; single grain; slightly hard, friable, nonsticky, nonplastic; many fine interstitial pores; many medium irregular gypsum crystals throughout; noneffervescent, 95 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 3.1 dS/m (mmhos/cm); very slightly saline; diffuse wavy boundary.

Cyy2—10 to 63 inches (25 to 160 centimeters); white (10YR 8.5/1) gypsiferous sand, white (2.5YR 8/1) moist; 1 percent clay; single grain; slightly hard, friable, nonsticky, nonplastic; many fine interstitial pores; many medium irregular gypsum crystals throughout; noneffervescent, 97 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 3.3 dS/m (mmhos/cm); very slightly saline.

Range in Characteristics
   Note: This component consists of unstabilized mounds, ridges, banks, or hills of loose eolian materials (typically sands) that are usually devoid of vegetation and capable of movement from place to place.

Clay content of control section (weighted average): 0 to 5 percent

Cyy horizons:
   Hue—10YR or 2.5Y
   Value—8 to 9.5 dry; 7 to 9 moist
   Chroma—1 to 2, dry or moist
   Texture—gypsiferous sand or gypsiferous fine sand
   Gypsum content—90 to 100 percent
   Reaction—slightly alkaline or moderately alkaline
Figure 114.—An area of map unit 84 (Tulargo loam, 3 to 20 percent slopes).

84—Tulargo loam, 3 to 20 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts (fig. 114)
Elevation: 5,720 to 6,540 feet (1,745 to 1,992 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 120 to 180 days
Major Land Resource Area: 70C—Central New Mexico Highlands
Land Resource Unit: 70C.1 Central New Mexico Highlands

Map Unit Composition

Tulargo and similar soils: 98 percent
Minor components: 2 percent
  Ustic Haplogypsids with a coarse-loamy particle-size class and similar soils
  Ustic Haplogypsids with a loamy-skeletal particle-size class and similar soils
  Riverwash
  Rock outcrop

Description of the Tulargo Soil

Taxonomic classification: Fine-loamy, gyspic, mesic Ustic Calcigypsids
Geomorphic position: Fan piedmonts adjacent to gypsiferous rock outcrop
Parent material: Gypsiferous fine-loamy alluvium
Slope: 3 to 20 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
moss—0 percent  
cryptogamic crust—25 percent  

Chemical crust:  
salt—0 percent  
gypsum—0 percent  

Physical cover:  
canopy plant cover—15 percent  
woody debris—5 percent  
bare soil—60 percent  
rock fragments—3 percent gravel  

Drainage class: Well drained  

$K_{sat}$ (solum): 0.20 to 0.57 inch per hour (1.40 to 4.00 micrometers per second)  

Available water capacity (total inches): 9.6 (high)  

Shrink-swell potential: About 2.4 LEP (low)  

Flooding hazard: None  

Runoff class: Medium  

Hydrologic group: C  

Ecological site name: Loamy  

Ecological site number: R070CY109NM  

Present vegetation: Desert holly and yucca  

Land capability classification (nonirrigated areas): 6c

**Typical Pedon**

*Location by Geographic Coordinate System:* lat. 33 degrees 16 minutes 56.20 seconds N. and long. 106 degrees 43 minutes 48.70 seconds W.

A—0 to 6.5 inches (0 to 16 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 18 percent clay; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; common very fine and few fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 3 percent gravel; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw—6.5 to 21 inches (16 to 53 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 22 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots throughout; few fine dendritic tubular pores; finely disseminated carbonate throughout; 5 percent gravel; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.3; clear wavy boundary.

Bky1—21 to 38.5 inches (53 to 98 centimeters); light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; 23 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate, common fine spherical gypsum masses, and common fine spherical carbonate masses throughout; 10 percent gravel; violently effervescent, 14 percent calcium carbonate equivalent and 12 percent gypsum; moderately alkaline, pH 8.4; clear wavy boundary.

Bky2—38.5 to 60 inches (98 to 152 centimeters); light yellowish brown (10YR 6/4) gypsiferous loam, yellowish brown (10YR 5/4) moist; 24 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine dendritic tubular pores; finely disseminated carbonate, many fine spherical gypsum masses, and common fine spherical carbonate masses throughout; 10 percent gravel; violently effervescent, 3 percent calcium carbonate equivalent and 24 percent gypsum; moderately alkaline, pH 8.2.
Range in Characteristics

Note: The Tulargo soil in this map unit is considered a taxadjunct to the Tulargo series because it has a calcic horizon and gypsic mineralogy.

Clay content of control section (weighted average): 22 to 24 percent
Rock fragment content in control section: 5 to 10 percent

A horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5, dry or moist
- Chroma—4 to 6, dry or moist
- Texture—sandy loam, fine sandy loam, or loam
- Clay content—10 to 20 percent

Bw horizon:
- Hue—7.5YR or 10YR
- Value—4 to 5, dry or moist
- Chroma—4 to 6, dry or moist
- Texture—loam or clay loam

Bky horizons:
- Hue—7.5YR or 10YR
- Value—4 to 7 dry; 3 to 6 moist
- Chroma—4 to 6, dry or moist
- Texture—gypsiferous loam, loam, gypsiferous clay loam, or clay loam
- Clay content—16 to 32 percent
- Calcium carbonate equivalent—3 to 20 percent
- Gypsum content—12 to 40 percent

Diagnostic Features

- Ochric epipedon—the zone from 0 to 6.5 inches (A and Bw horizons)
- Cambic horizon—the zone from 6.5 to 21 inches (Bw horizon)
- Gypsic horizon—the zone from 21 to 60 inches (Bky1 and Bky2 horizons)

85—Typic Petrogypsids-Oxyaquic Torriorthents complex, 0 to 8 percent slopes

Map Unit Setting

Landform(s): Dunes, interdunes, and playa steps (fig. 115)
Elevation: 3,880 to 3,930 feet (1,182 to 1,198 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Typic Petrogypsids, shallow and similar soils: 45 percent
Typic Petrogypsids, moderately deep and similar soils: 25 percent
Oxyaquic Torriorthents and similar soils: 20 percent
Minor components: 10 percent
Typic Aquisalids and similar soils
Typic Haplosalids and similar soils
Typic Torripsamments and similar soils
Duneland

Description of the Typic Petrogypsids, Shallow

*Taxonomic classification:* Typic Petrogypsids

*Geomorphic position:* Relict interdune areas on playa steps

*Parent material:* Gypsiferous eolian deposits

*Slope:* 0 to 8 percent

*Surface cover*

  * Biological crust:
    * cyanobacteria—0 percent
    * lichen—0 percent
    * moss—0 percent
    * cryptogamic crust—15 percent

  * Chemical crust:
    * salt—0 percent
    * gypsum—0 percent

  * Physical cover:
    * canopy plant cover—35 percent
    * woody debris—5 percent
    * bare soil—50 percent
    * rock fragments—0 percent

*Depth to restrictive feature(s):* 6 to 12 inches to petrogypsic horizon

*Drainage class:* Somewhat excessively drained

*K<sub>sat</sub> (solum):* 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)

*K<sub>sat</sub> (restrictive layer):* 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

*Available water capacity (total inches):* 0.7 (very low)

*Shrink-swell potential:* About 1.1 LEP (low)

*Flooding hazard:* Very rare
Ponding hazard: Occasional
Runoff class: Negligible
Hydrologic group: D
Ecological site name: Gyp Outcrop
Ecological site number: R042XB007NM
Present vegetation: Ephedra, hairy coldenia, mesquite, and soaptree yucca
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 51 minutes 16.90 seconds N. and long. 106 degrees 27 minutes 40.70 seconds W.

Ayy—0 to 2 inches (0 to 5 centimeters); pale brown (10YR 6/3) gypsiferous sandy loam, brown (10YR 5/3) moist; 10 percent clay; moderate medium platy structure; soft, very friable, slightly sticky, slightly plastic; common fine roots throughout; many medium interstitial pores; finely disseminated gypsum and carbonate throughout; slightly effervescent, 5 percent calcium carbonate equivalent and 60 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 4.6 dS/m (mmhos/cm); slightly saline; gradual smooth boundary.

Cyy—2 to 10 inches (5 to 25 centimeters); white (2.5Y 8/1) gypsiferous sand, light gray (2.5Y 7/1) moist; 3 percent clay; single grain; moderately hard, friable, nonsticky, nonplastic; many medium interstitial pores; finely disseminated carbonate and gypsum throughout; slightly effervescent, 5 percent calcium carbonate equivalent and 74 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline; abrupt smooth boundary.

2Byym—10 to 60 inches (25 to 152 centimeters); white (2.5Y 8/1) very strongly cemented material, light gray (2.5Y 7/1) moist; slightly effervescent, 4 percent calcium carbonate equivalent and 78 percent gypsum; moderately alkaline, pH 8.4; electrical conductivity of 4.5 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Note: Typic Petrogypsids, shallow have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 5 to 10 percent

Ayy horizon:
Hue—10YR or 2.5Y
Value—6 to 7 dry; 5 to 6 moist
Chroma—3 to 4, dry or moist
Calcium carbonate equivalent—0 to 5 percent
Gypsum content—40 to 100 percent
Salinity—very slightly saline or slightly saline

Cyy horizon:
Value—7 to 9 dry; 7 to 8 moist
Chroma—1 to 2, dry or moist
Calcium carbonate equivalent—0 to 5 percent
Gypsum content—40 to 100 percent
Salinity—very slightly saline or slightly saline

2Byym horizon:
Cemented material—gypsum
Hardness—strongly cemented or very strongly cemented
Thickness—127 to 150 inches; laterally discontinuous
Diagnostic Features

- Ochric epipedon—the zone from 0 to 2 inches (Ayy horizon)
- Petrogypsic horizon—the zone from 10 to 60 inches (2Byym horizon)

Description of the Typic Petrogypsids, Moderately Deep

Taxonomic classification: Typic Petrogypsids
Geomorphic position: Relict dune areas on playa steps
Parent material: Gypsiferous eolian sands
Slope: 0 to 8 percent
Surface cover
  - Biological crust:
    - cyanobacteria—0 percent
    - lichen—0 percent
    - moss—0 percent
    - cryptogamic crust—3 percent
  - Chemical crust:
    - salt—0 percent
    - gypsum—0 percent
  - Physical cover:
    - canopy plant cover—10 percent
    - woody debris—2 percent
    - bare soil—85 percent
    - rock fragments—0 percent

Depth to restrictive feature(s): 19.5 to 31.5 inches to petrogypsic horizon
Drainage class: Excessively drained

\( K_{sat} \) (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

\( K_{sat} \) (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)

Available water capacity (total inches): 1.3 (very low)
Shrink-swell potential: About 0.5 LEP (low)
Flooding hazard: Very rare
Ponding hazard: Occasional
Runoff class: Negligible
Hydrologic group: B
Ecological site name: Gyp Upland
Ecological site number: R042XB006NM
Present vegetation: Alkali sacaton, fourwing saltbush, hairy coldenia, honey mesquite, iodinebush, soaptree yucca, and Torrey ephedra
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 53 minutes 21.70 seconds N. and long. 106 degrees 27 minutes 21.70 seconds W.

Cyy1—0 to 1.5 inches (0 to 4 centimeters); light gray (10YR 7/2) gypsiferous coarse sand, grayish brown (10YR 5/2) moist; 1 percent clay; moderate thick platy structure; moderately hard, friable, nonsticky, nonplastic; few fine roots throughout; many medium interstitial pores; finely disseminated carbonate and gypsum throughout; slightly effervescent, 4 percent calcium carbonate equivalent and 72 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 4.8 dS/m (mmhos/cm); slightly saline; abrupt smooth boundary.

Cyy2—1.5 to 25 inches (4 to 64 centimeters); white (2.5Y 8/1) gypsiferous coarse sand, light gray (2.5Y 7/2) moist; 1 percent clay; massive; moderately hard, friable, nonsticky, nonplastic; many medium interstitial pores; finely disseminated carbonate and gypsum throughout; slightly effervescent, 4 percent calcium
carbonate equivalent and 79 percent gypsum; moderately alkaline, pH 8.0; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline; abrupt smooth boundary.

2Byym—25 to 60 inches (64 to 152 centimeters); white (2.5Y 8/1) very strongly cemented material, light gray (2.5Y 7/1) moist; noneffervescent, 0 percent calcium carbonate equivalent and 82 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 4.5 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Note: Typic Petrogypsids, moderately deep have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 0 to 5 percent

Cyy horizons:
- Hue—10YR or 2.5Y
- Value—7 to 9 dry; 5 to 8 moist
- Chroma—1 to 2, dry or moist
- Calcium carbonate equivalent—0 to 5 percent
- Gypsum content—40 to 100 percent
- Salinity—very slightly saline or slightly saline

2Byym horizon:
- Cemented material—gypsum
- Hardness—strongly cemented or very strongly cemented
- Thickness—25 to 40 inches; laterally discontinuous

Diagnostic Features
- Petrogypsic horizon—the zone from 25 to 60 inches (2Byym horizon)

Description of the Oxyaquic Torriorthents

Taxonomic classification: Oxyaquic Torriorthents
Geomorphic position: Playa steps
Parent material: Gypsiferous eolian deposits and/or gypsiferous lacustrine deposits
Slope: 0 to 4 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—30 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
- Physical cover:
  - canopy plant cover—30 percent
  - woody debris—5 percent
  - bare soil—40 percent
  - rock fragments—0 percent

Drainage class: Moderately well drained
$K_{sat}$ (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)
Available water capacity (total inches): 5.9 (moderate)
Shrink-swell potential: About 1.2 LEP (low)
Flooding hazard: Very rare
Ponding hazard: Occasional
Depth to seasonal high water table (minimum): About 35 to 43 inches
Runoff class: Negligible
Hydrologic group: B
Ecological site name: Gyp Interdune (Wet)
Ecological site number: R042XB004NM
Present vegetation: Alkali sacaton and pickleweed
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 52 minutes 23.30 seconds N. and long. 106 degrees 27 minutes 21.10 seconds W.

Ayyz—0 to 4 inches (0 to 10 centimeters); pale brown (10YR 6/3) gypsiferous sandy loam, brown (10YR 5/3) moist; 10 percent clay; weak thin platy over weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common fine roots throughout; few fine tubular pores; finely disseminated carbonate and gypsum throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 56 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 12.6 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Cyyz1—4 to 17.5 inches (10 to 45 centimeters); white (2.5Y 9.5/1) gypsiferous loamy sand, white (2.5Y 8/1) moist; 6 percent clay; massive; moderately hard, friable, nonsticky, nonplastic; common fine roots throughout; many medium interstitial pores; finely disseminated carbonate and gypsum throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 76 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 8.6 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Cyyz2—17.5 to 35.5 inches (45 to 90 centimeters); white (2.5Y 9/1) gypsiferous sandy loam, light gray (2.5Y 7/2) moist; 10 percent clay; massive; moderately hard, friable, nonsticky, nonplastic; common medium interstitial pores; finely disseminated gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent and 75 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 9.0 dS/m (mmhos/cm); moderately saline; abrupt smooth boundary.

2Cyyzg—35.5 to 60 inches (90 to 152 centimeters); light gray (N 7/0) gypsiferous sandy loam, gray (N 6/0) moist; 14 percent clay; massive; slightly hard, friable, slightly sticky, slightly plastic; common medium interstitial pores; finely disseminated carbonate and gypsum throughout; very slightly effervescent, 1 percent calcium carbonate equivalent and 71 percent gypsum; slightly alkaline, pH 7.7; electrical conductivity of 9.6 dS/m (mmhos/cm); moderately saline.

Range in Characteristics

Note: Oxyaquic Torriorthents have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 8 to 12 percent

Ayyz horizon:
  Hue—10YR or 2.5Y
  Value—6 to 7 dry; 5 to 6 moist
  Chroma—1 to 3, dry or moist
  Calcium carbonate equivalent—0 to 4 percent
  Gypsum content—15 to 30 percent
  Salinity—very slightly saline or moderately saline

Cyyz horizons:
  Value—7 to 9.5 dry; 7 to 8 moist
  Chroma—1 to 2, dry or moist
  Texture—gypsiferous loamy sand or gypsiferous sandy loam
Calcium carbonate equivalent—0 to 4 percent
Gypsum content—40 to 100 percent
Salinity—very slightly saline or moderately saline

2Cyyzg horizon:
  Hue—neutral or 10Y
  Value—6 to 8, dry or moist
  Calcium carbonate equivalent—0 to 2 percent
  Gypsum content—40 to 100 percent
  Salinity—very slightly saline or moderately saline

Diagnostic Features
  • Ochric epipedon—the zone from 0 to 4 inches (Ayyz horizon)
  • Endosaturation—the zone from 37.5 to 60 inches

86—Typic Torriorthents-Corvus complex, 0 to 6 percent slopes

Map Unit Setting

Landform(s): Drainageways and shore complexes (fig. 116)
Elevation: 3,890 to 3,950 feet (1,185 to 1,205 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub
Map Unit Composition

Typic Torriorthents and similar soils: 40 percent
Corvus and similar soils: 35 percent
Minor components: 25 percent
   Typic Petrogypsids with a fine-gypseous particle-size class
   Peligro and similar soils
   Gullied land

Description of the Typic Torriorthents

Taxonomic classification: Typic Torriorthents
Geomorphic position: Shoreline edges influenced by piedmont alluvium
Parent material: Alluvium
Slope: 0 to 3 percent
Surface cover
   Biological crust: cyanobacteria—0 percent
   lichen—0 percent
   moss—0 percent
   cryptogamic crust—0 percent
Chemical crust: salt—0 percent
   gypsum—0 percent
Physical cover:
   canopy plant cover—35 percent
   woody debris—5 percent
   bare soil—70 percent
   rock fragments—0 percent
Drainage class: Well drained
$K_{sat}$ (solum): 0.20 to 0.57 inch per hour (1.40 to 4.00 micrometers per second)
Available water capacity (total inches): 11.4 (very high)
Shrink-swell potential: About 3.3 LEP (moderate)
Flooding hazard: Occasional
Ponding hazard: Rare
Runoff class: Negligible
Hydrologic group: C
Ecological site name: Salty Bottomland
Ecological site number: R042XB033NM
Present vegetation: Alkali sacaton and tamarisk
Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 51 minutes 3.70 seconds N. and long. 106 degrees 27 minutes 56.10 seconds W.

Cyz1—0 to 12 inches (0 to 30 centimeters); yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; 34 percent clay; massive; soft, very friable, very sticky, very plastic; few fine roots throughout; common fine dendritic tubular pores; finely disseminated salt, carbonate, and gypsum throughout; slightly effervescent, 8 percent calcium carbonate equivalent and 11 percent gypsum; moderately alkaline, pH 8.4; electrical conductivity of 29.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Cyz2—12 to 60 inches (30 to 152 centimeters); pale brown (10YR 6/3) gysiferous silty clay loam, brown (10YR 5/3) moist; 31 percent clay; massive; slightly hard, friable, very sticky, very plastic; common fine dendritic tubular pores; finely
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disseminated carbonate, gypsum, and salt throughout; strongly effervescent, 15 percent calcium carbonate equivalent and 26 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 23.0 dS/m (mmhos/cm); strongly saline.

Range in Characteristics

Note: Typic Torriorthents have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 25 to 36 percent

Cyz horizons:
Hue—5YR, 7.5YR, or 10YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—3 to 6, dry or moist
Texture—sandy loam, fine sandy loam, loam, silt loam, sandy clay loam, clay loam, silty clay loam, or gypsiferous silty clay loam
Clay content—18 to 36 percent
Calcium carbonate equivalent—0 to 20 percent
Gypsum content—5 to 40 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—slightly saline to strongly saline

Description of the Corvus Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic, shallow Typic Petrogypsids
Geomorphic position: Relict dunes on relict shoreline complexes
Parent material: Gypsiferous eolian deposits or gypsiferous lacustrine deposits
Slope: 1 to 6 percent
Surface cover
Biological crust:
   cyanobacteria—0 percent
   lichen—0 percent
   moss—0 percent
   cryptogamic crust—50 percent
Chemical crust:
   salt—0 percent
   gypsum—25 percent
Physical cover:
   canopy plant cover—15 percent
   woody debris—5 percent
   bare soil—20 percent
   rock fragments—0 percent
Depth to restrictive feature(s): 12 to 19.5 inches to petrogypsic horizon
Drainage class: Well drained
K_{sat} (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)
K_{sat} (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)
Available water capacity (total inches): 0.9 (very low)
Shrink-swell potential: About 1.0 LEP (low)
Flooding hazard: None
Ponding hazard: None
Runoff class: High
Hydrologic group: D
Ecological site name: Gyp Outcrop
Ecological site number: R042XB007NM
Present vegetation: Coldenia, creosote bush, fourwing saltbush, gyp dropseed, honey mesquite, and Torrey's jointfir

Land capability classification (nonirrigated areas): 7c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 39 minutes 46.80 seconds N. and long. 106 degrees 24 minutes 4.40 seconds W.

Ayy—0 to 3 inches (0 to 8 centimeters); pinkish gray (7.5YR 7/2) gypsiferous loamy sand, brown (7.5YR 5/4) moist; 6 percent clay; weak medium subangular blocky and weak thin platy structure; soft, very friable, nonsticky, nonplastic; finely disseminated carbonate and gypsum throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 47 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 4.4 dS/m (mmhos/cm); slightly saline; gradual smooth boundary.

Byy1—3 to 8 inches (8 to 20 centimeters); pink (7.5YR 7/3) gypsiferous loamy sand, brown (7.5YR 5/4) moist; 6 percent clay; weak medium subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated gypsum and carbonate and common medium irregular gypsum masses throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 76 percent gypsum; slightly alkaline, pH 7.6; electrical conductivity of 5.0 dS/m (mmhos/cm); slightly saline; abrupt smooth boundary.

Byy2—8 to 15.5 inches (20 to 40 centimeters); pale pinkish white (7.5YR 9/2) gypsiferous loamy sand, pink (7.5YR 7/3) moist; 8 percent clay; weak medium subangular blocky structure; moderately hard, firm, nonsticky, nonplastic; few fine roots throughout; few fine dendritic tubular pores; finely disseminated gypsum and common medium irregular gypsum masses throughout; noneffervescent, 0 percent calcium carbonate equivalent and 82 percent gypsum; slightly alkaline, pH 7.8; electrical conductivity of 5.4 dS/m (mmhos/cm); slightly saline; abrupt smooth boundary.

Byym—15.5 to 60 inches (40 to 152 centimeters); white (2.5Y 8/1) very strongly cemented material, light gray (2.5Y 7/1) moist; noneffervescent, 0 percent calcium carbonate equivalent and 80 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 6.0 dS/m (mmhos/cm); slightly saline.

Range in Characteristics

Clay content of control section (weighted average): 5 to 20 percent

Ayy horizon:

Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—1 to 4, dry or moist
Texture—gypsiferous loamy sand, gypsiferous loamy fine sand, gypsiferous sandy loam, fine sandy loam, or loam
Clay content—5 to 20 percent
Calcium carbonate equivalent—0 to 5 percent
Gypsum content—15 to 80 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—slightly saline or moderately saline

Byy horizons:

Hue—7.5YR or 10YR
Value—6 to 9 dry; 5 to 8 moist
Chroma—2 to 4, dry or moist
Texture—gypsiferous loamy sand, gypsiferous sandy loam, or gypsiferous loam
Clay content—5 to 20 percent
Calcium carbonate equivalent—0 to 5 percent
Gypsum content—40 to 90 percent
Reaction—slightly alkaline or moderately alkaline
Salinity—slightly saline or moderately saline

Byym horizon:
Hardness—strongly cemented or very strongly cemented
Thickness—20 to 50 inches; laterally continuous

Diagnostic Features
- Ochric epipedon—the zone from 0 to 3 inches (Ayy horizon)
- Gypsic horizon—the zone from 3 to 15.5 inches (Byy1 and Byy2 horizons)
- Petrogypsic horizon—the zone from 15.5 to 60 inches (Byym horizon)

87—Ustic Haplalgids-La Fonda complex, 0 to 20 percent slopes

Map Unit Setting

Landform(s): Fan piedmonts (fig. 117)
Elevation: 5,070 to 6,690 feet (1,544 to 2,038 meters)
Mean annual precipitation: 12 to 14 inches (305 to 356 millimeters)
Mean annual air temperature: 50 to 54 degrees F (10.0 to 12.0 degrees C)
Mean annual soil temperature: 52 to 56 degrees F (11.1 to 13.1 degrees C)
Frost-free period: 120 to 180 days
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Major Land Resource Area: 70C—Central New Mexico Highlands
Land Resource Unit: 70C.1 Central New Mexico Highlands

Map Unit Composition

Ustic Haplargids and similar soils: 50 percent
La Fonda and similar soils: 44 percent
Minor components: 6 percent

Argiustolls, shallow
Ustic Haplocalcids with a loamy-skeletal particle-size class and similar soils
Ustic Calcargids and similar soils

Description of the Ustic Haplargids

Taxonomic classification: Ustic Haplargids
Geomorphic position: Footslopes and stream terraces of fan piedmonts
Parent material: Fine-loamy alluvium derived from sandstone and shale
Slope: 1 to 20 percent
Surface cover

Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent

Chemical crust:
salt—0 percent
gypsum—0 percent

Physical cover:
canopy plant cover—60 percent
woody debris—10 percent
bare soil—40 percent
rock fragments—0 percent

Drainage class: Well drained
$K_{sat}$ (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)
Available water capacity (total inches): 10.3 (very high)
Shrink-swell potential: About 4.0 LEP (moderate)
Flooding hazard: Rare
Runoff class: Low
Hydrologic group: C
Ecological site name: Loamy
Ecological site number: R070CY109NM
Present vegetation: Blue grama, cholla, and oneseed juniper
Land capability classification (nonirrigated areas): 6c

Typical Pedon (fig. 118)

Location by Geographic Coordinate System: lat. 33 degrees 14 minutes 36.20 seconds N. and long. 106 degrees 43 minutes 35.10 seconds W.

A—0 to 4.5 inches (0 to 11 centimeters); reddish brown (5YR 4/4) silt loam, reddish brown (5YR 4/3) moist; 23 percent clay; weak medium platy over weak coarse granular structure; soft, very friable, slightly sticky, slightly plastic; few medium and common very fine and fine roots throughout; common very fine dendritic tubular pores; finely disseminated carbonate throughout; 1 percent gravel; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.
Figure 118.—Profile of the Ustic Haplargids in map unit 87 (Ustic Haplargids-La Fonda complex, 0 to 20 percent slopes). Scale is in centimeters.

Bw—4.5 to 12 inches (11 to 30 centimeters); reddish brown (5YR 4/4) silt loam, reddish brown (5YR 4/3) moist; 26 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; common very fine and fine roots throughout; few medium and common very fine dendritic tubular
pores; finely disseminated carbonate throughout; strongly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.2 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bt—12 to 31.5 inches (30 to 80 centimeters); dark reddish brown (5YR 3/3) silty clay loam, dark reddish brown (5YR 3/2) moist; 27 percent clay; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and few fine roots throughout; few medium and common fine dendritic tubular pores; common prominent clay films on all faces of peds; finely disseminated carbonate throughout; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Btk1—31.5 to 45.5 inches (80 to 115 centimeters); reddish brown (5YR 4/3) silty clay loam, dark reddish brown (5YR 3/3) moist; 27 percent clay; strong medium and moderate fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots throughout; common medium and few coarse dendritic tubular pores; common prominent clay films on all faces of peds; common fine and medium threadlike carbonate masses throughout; strongly effervescent, 6 percent calcium carbonate equivalent; slightly alkaline, pH 7.7; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; diffuse wavy boundary.

Btk2—45.5 to 60 inches (115 to 152 centimeters); reddish brown (5YR 4/3) silty clay loam, dark reddish brown (5YR 3/3) moist; 29 percent clay; weak medium prismatic structure parting to strong medium subangular blocky; very hard, very firm, moderately sticky, moderately plastic; common fine dendritic tubular pores; many prominent clay films on all faces of peds; common very fine, fine, and medium threadlike carbonate masses throughout; strongly effervescent, 7 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Note: Ustic Haplargids have soil properties that vary beyond family class limits.

Clay content of control section (weighted average): 18 to 35 percent

A horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—loam or silt loam
- Clay content—18 to 27 percent
- Reaction—slightly alkaline or moderately alkaline

Bw horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—3 to 4, dry or moist
- Texture—loam or silt loam
- Clay content—18 to 27 percent
- Reaction—slightly alkaline or moderately alkaline

Bt horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—3 to 5 dry; 3 to 4 moist
- Chroma—2 to 4, dry or moist
- Texture—loam, clay loam, or silty clay loam
- Clay content—18 to 35 percent
- Reaction—slightly alkaline or moderately alkaline


Btk horizons:
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—3 to 4, dry or moist
- Texture—loam, clay loam, or silty clay loam
- Clay content—18 to 35 percent
- Calcium carbonate equivalent—5 to 15 percent
- Reaction—slightly alkaline or moderately alkaline

Diagnostic Features
- Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
- Cambic horizon—the zone from 4.5 to 12 inches (Bw horizon)
- Argillic horizon—the zone from 12 to 60 inches (Bt, Btk1, and Btk2 horizons)

Description of the La Fonda Soil

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids
Geomorphic position: Toeslopes and stream terraces of fan piedmonts
Parent material: Fine-loamy alluvium derived from sandstone and shale
Slope: 0 to 5 percent
Surface cover
- Biological crust:
  - cyanobacteria—0 percent
  - lichen—0 percent
  - moss—0 percent
  - cryptogamic crust—0 percent
- Chemical crust:
  - salt—0 percent
  - gypsum—0 percent
Physical cover:
- canopy plant cover—65 percent
- woody debris—15 percent
- bare soil—30 percent
- rock fragments—0 percent
Drainage class: Well drained
$K_{sat}$ (solum): 0.20 inch to 1.98 inches per hour (1.40 to 14.00 micrometers per second)
Available water capacity (total inches): 9.6 (high)
Shrink-swell potential: About 3.1 LEP (moderate)
Flooding hazard: Rare
Runoff class: Low
Hydrologic group: C
Ecological site name: Loamy
Ecological site number: R070CY109NM
Present vegetation: Blue grama, cholla, and oneseed juniper
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 33 degrees 49 minutes 23.20 seconds N. and long. 106 degrees 17 minutes 25.80 seconds W.
A—0 to 2.5 inches (0 to 6 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 18 percent clay; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few fine roots throughout; finely disseminated carbonate throughout; strongly effervescent, 5 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.3 dS/m (mmhos/cm); nonsaline; abrupt smooth boundary.
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Bw—2.5 to 20.5 inches (6 to 52 centimeters); brown (7.5YR 4/4) loam, dark brown (7.5YR 3/4) moist; 24 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and few fine roots throughout; few medium and common fine dendritic tubular pores; finely disseminated carbonate throughout; 1 percent gravel; violently effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk1—20.5 to 55 inches (52 to 140 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 22 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine dendritic tubular pores; common very fine irregular carbonate masses throughout; 1 percent gravel; violently effervescent, 11 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.7 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bk2—55 to 60 inches (140 to 152 centimeters); light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; 24 percent clay; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots throughout; few very fine dendritic tubular pores; very few distinct carbonate coats on rock fragments; common fine irregular carbonate masses throughout; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline, pH 8.4; electrical conductivity of 1.1 dS/m (mmhos/cm); nonsaline.

Range in Characteristics

Clay content of control section (weighted average): 15 to 27 percent

A horizon:
Hue—5YR or 7.5YR
Value—4 to 5 dry; 3 to 4 moist
Chroma—3 to 4, dry or moist
Texture—sandy loam, loam, or silt loam
Clay content—18 to 27 percent

Bw horizon:
Hue—5YR or 7.5YR
Value—4 to 5 dry; 3 to 4 moist
Chroma—3 to 4, dry or moist
Texture—loam or silt loam
Clay content—18 to 27 percent

Bk horizons:
Hue—5YR or 7.5YR
Value—3 to 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—loam or silt loam
Clay content—18 to 27 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizons)
• Cambic horizon—the zone from 2.5 to 20.5 inches (Bw horizon)

88—Whitlock-Pajarito complex, 1 to 8 percent slopes

Map Unit Setting

Landform(s): Dunes and interdunes (fig. 119)
Elevation: 4,670 to 5,640 feet (1,423 to 1,718 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Whitlock and similar soils: 40 percent
Pajarito and similar soils: 35 percent
Minor components: 25 percent
  Adelino and similar soils
  Copia and similar soils
  Turney and similar soils
  Yesum and similar soils

Description of the Whitlock Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, thermic Typic Haplocalcids
Geomorphic position: Interdunes in stabilized dune fields
Parent material: Eolian deposits over calcareous basin alluvium
Slope: 1 to 5 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
Physical cover:
  canopy plant cover—40 percent
  woody debris—14 percent
  bare soil—53 percent
  rock fragments—1 percent gravel

Drainage class: Well drained

$K_{sat}$ (solum): 1.98 to 19.98 inches per hour (14.00 to 141.00 micrometers per second)

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

Shrink-swell potential: About 1.3 LEP (low)

Flooding hazard: None

Runoff class: Very low

Hydrologic group: A

Ecological site name: Sandy

Ecological site number: R042XB012NM

Present vegetation: Broom snakeweed, dropseed, sand sagebrush, soaptree yucca, forbs, and annuals

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 120)

Location by Geographic Coordinate System: lat. 33 degrees 38 minutes 29.70 seconds N. and long. 106 degrees 43 minutes 54.30 seconds W.

A—0 to 2 inches (0 to 5 centimeters); light yellowish brown (10YR 6/4) loamy sand, brown (7.5YR 4/4) moist; 7 percent clay; moderate medium platy structure; soft, very friable, nonsticky, nonplastic; few very fine roots throughout; few very fine tubular pores; finely disseminated carbonate throughout; slightly effervescent, 2 percent calcium carbonate equivalent; moderately alkaline, pH 8.2; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear smooth boundary.

Bw—2 to 12 inches (5 to 30 centimeters); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; 9 percent clay; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and common fine roots throughout; few very fine tubular pores; finely disseminated carbonate throughout; strongly effervescent, 7 percent calcium carbonate equivalent; slightly alkaline, pH 7.6; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk1—12 to 28 inches (30 to 71 centimeters); very pale brown (10YR 8/3) sandy loam, light yellowish brown (10YR 6/4) moist; 9 percent clay; moderate fine and medium subangular blocky structure; moderately hard, very friable, nonsticky, nonplastic; common very fine and few fine roots throughout; few very fine tubular pores; many medium irregular carbonate masses throughout; violently effervescent, 13 percent calcium carbonate equivalent; moderately alkaline, pH 7.9; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk2—28 to 56 inches (71 to 142 centimeters); white (10YR 8/1) sandy loam, very pale brown (10YR 8/2) moist; 13 percent clay; moderate fine, medium, and coarse subangular blocky structure; moderately hard, very friable, nonsticky, nonplastic; few very fine roots throughout; few very fine tubular pores; many fine irregular carbonate masses and common medium irregular carbonate nodules throughout; 1 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bk3—56 to 60 inches (142 to 152 centimeters); very pale brown (10YR 8/2) loamy sand, light gray (10YR 7/2) moist; 6 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common coarse irregular carbonate nodules throughout; 2 percent gravel; violently effervescent, 10 percent...
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Calcium carbonate equivalent; moderately alkaline, pH 8.1; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 10 to 14 percent

*Other characteristics:* Some pedons do not have a Bw horizon

**A horizon:**
- Hue—7.5YR or 10YR
- Value—4 to 6 dry; 3 to 5 moist
- Chroma—4 to 6, dry or moist
- Texture—loamy sand, loamy fine sand, or sandy loam
- Clay content—6 to 11 percent
- Rock fragment content—0 to 4 percent
- Calcium carbonate equivalent—0 to 5 percent

Figure 120.—Profile of the Whitlock soil in map unit 88 (Whitlock-Pajarito complex, 1 to 8 percent slopes). Scale is in centimeters.
Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 5 dry; 3 to 5 moist
Chroma—4 to 6, dry or moist
Clay content—6 to 15 percent
Rock fragment content—0 to 9 percent
Reaction—slightly alkaline or moderately alkaline
Calcium carbonate equivalent—2 to 10 percent

Bk horizons:
Hue—7.5YR or 10YR
Value—6 to 8 dry; 5 to 8 moist
Chroma—1 to 4, dry or moist
Texture—loamy sand, coarse sandy loam, or sandy loam
Clay content—6 to 16 percent
Rock fragment content—0 to 13 percent
Calcium carbonate equivalent—10 to 30 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 7 inches (A and Bw horizon)
• Cambic horizon—the zone from 2 to 12 inches (Bw horizon)
• Calcic horizon—the zone from 12 to 60 inches (Bk1, Bk2, and Bk3 horizons)

Description of the Pajarito Soil

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

Geomorphic position: Dunes in stabilized dune fields
Parent material: Eolian deposits over calcareous basin alluvium
Slope: 1 to 8 percent

Surface cover
Biological crust:
cyanobacteria—0 percent
lichen—0 percent
moss—0 percent
cryptogamic crust—0 percent

Chemical crust:
salt—0 percent
gypsum—0 percent

Physical cover:
canopy plant cover—30 percent
woody debris—10 percent
bare soil—65 percent
rock fragments—0 percent

Drainage class: Well drained
$K_{sat}$ (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Available water capacity (total inches): 6.6 (moderate)
Shrink-swell potential: About 1.3 LEP (low)
Flooding hazard: None
Runoff class: Very low
Hydrologic group: A
Ecological site name: Sandy
Ecological site number: R042XB012NM
Present vegetation: Threeawn, black grama, broom snakeweed, bush muhly, dropseed, ephedra, sand dropseed, sand sagebrush, and soaptree yucca

Land capability classification (nonirrigated areas): 7c
Typical Pedon

*Location by Geographic Coordinate System:* lat. 33 degrees 43 minutes 56.20 seconds N. and long. 106 degrees 29 minutes 36.90 seconds W.

A—0 to 1 inch (0 to 3 centimeters); yellowish red (5YR 5/6) loamy sand, dark reddish brown (5YR 3/4) moist; 8 percent clay; moderate very thick platy structure; soft, very friable, nonsticky, nonplastic; common very fine roots throughout; many very fine interstitial pores; noneffervescent; moderately alkaline, pH 8.1; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline; diffuse wavy boundary.

Bw1—1 to 4.5 inches (3 to 11 centimeters); strong brown (7.5YR 4/6) sandy loam, dark brown (7.5YR 3/4) moist; 13 percent clay; moderate medium and coarse subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine roots throughout; few very fine tubular pores; noneffervescent; moderately alkaline, pH 8.0; electrical conductivity of 0.5 dS/m (mmhos/cm); nonsaline; diffuse wavy boundary.

Bw2—4.5 to 60 inches (11 to 152 centimeters); yellowish red (5YR 4/6) sandy loam, dark reddish brown (5YR 3/4) moist; 11 percent clay; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine tubular pores; finely disseminated carbonate throughout; very slightly effervescent, 1 percent calcium carbonate equivalent; moderately alkaline, pH 8.0; electrical conductivity of 0.6 dS/m (mmhos/cm); nonsaline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 10 to 12 percent

**A horizon:**
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 6 dry; 3 to 4 moist
- Chroma—4 to 6, dry or moist
- Texture—loamy sand, loamy fine sand, loamy very fine sand, or sandy loam
- Clay content—4 to 12 percent
- Rock fragment content—0 to 5 percent

**Bw horizons:**
- Hue—5YR or 7.5YR
- Value—4 to 5 dry; 3 to 4 moist
- Chroma—4 to 6, dry or moist
- Texture—sandy loam or fine sandy loam
- Clay content—5 to 15 percent
- Rock fragment content—0 to 9 percent
- Reaction—slightly alkaline or moderately alkaline

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 7 inches (A, Bw1, and Bw2 horizons)
- Cambic horizon—the zone from 1 to 60 inches (Bw1 and Bw2 horizons)

**89—Woodcutter-Rock outcrop complex, 30 to 90 percent slopes**

**Map Unit Setting**

*Landform(s):* Hills and ridges (fig. 121)
*Elevation:* 4,200 to 7,910 feet (1,280 to 2,410 meters)
*Mean annual precipitation:* 14 to 18 inches (356 to 457 millimeters)
*Mean annual air temperature:* 57 to 61 degrees F (14.0 to 16.0 degrees C)
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Mean annual soil temperature: 59 to 63 degrees F (15.1 to 17.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-5 Chihuahuan Desert Hills and Bajadas

Map Unit Composition

Woodcutter and similar soils: 70 percent
Rock outcrop: 25 percent
Minor components: 5 percent
  Aladdin and similar soils
  Aridic Calciustolls and similar soils
  Petrocalcic Paleustolls and similar soils

Description of the Woodcutter Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, thermic Aridic Lithic Argiustolls
Geomorphic position: All hillslope positions of granitic hills
Parent material: Gravelly and cobbly fine-loamy residuum weathered from granite
Slope: 30 to 60 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—0 percent

Figure 121.—An area of map unit 89 (Woodcutter-Rock outcrop complex, 30 to 90 percent slopes).
Chemical crust:
  salt—0 percent
  gypsum—0 percent
Physical cover:
  canopy plant cover—65 percent
  woody debris—3 percent
  bare soil—1 percent
  rock fragments—50 percent gravel, 25 percent cobbles, 10 percent stones, and
  10 percent boulders
Depth to restrictive feature(s): 8 to 14 inches to lithic bedrock
Drainage class: Well drained
K_{sat} (solum): 0.57 inch to 19.98 inches per hour (4.00 to 141.00 micrometers per
second)
K_{sat} (restrictive layer): 0.00 to 0.06 inch per hour (0.00 to 0.42 micrometer per second)
Available water capacity (total inches): 0.7 (very low)
Shrink-swell potential: About 1.9 LEP (low)
Flooding hazard: None
Runoff class: High
Hydrologic group: D
Ecological site name: Igneous Hills 13-16 inches
Ecological site number: R042XE002NM
Present vegetation: Blue grama, dropseed, ocotillo, sotol, and sumac
Land capability classification (nonirrigated areas): 6c

Typical Pedon

Location by Geographic Coordinate System: lat. 32 degrees 27 minutes 45.50
seconds N. and long. 106 degrees 31 minutes 20.60 seconds W.

A—0 to 3 inches (0 to 8 centimeters); brown (7.5YR 4/3) very gravelly loamy sand,
dark brown (7.5YR 3/2) moist; 6 percent clay; weak medium subangular blocky
structure; soft, very friable, nonsticky, nonplastic; common fine and medium roots
throughout; few medium and common fine tubular pores; 27 percent gravel and
10 percent cobbles; noneffervescent; neutral, pH 6.9; electrical conductivity of 0.2
dS/m (mmhos/cm); nonsaline; clear wavy boundary.

Bt—3 to 10 inches (8 to 25 centimeters); dark brown (7.5YR 3/2) very gravelly sandy
clay loam, very dark gray (7.5YR 3/1) moist; 24 percent clay; moderate medium
subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few
medium and common fine roots throughout; few very fine and fine tubular pores;
few faint clay films on all faces of peds; 25 percent gravel and 15 percent cobbles;
oneffervescent; neutral, pH 7.1; electrical conductivity of 0.1 dS/m (mmhos/cm);
nonsaline; abrupt wavy boundary.

R—10 inches (25 centimeters); unweathered, fractured, and very strongly cemented
granite.

Range in Characteristics

Clay content of control section (weighted average): 18 to 35 percent

A horizon:
  Hue—5YR or 7.5YR
  Value—3 to 4 dry; 2.5 to 3 moist
  Chroma—1 to 3, dry or moist
  Texture—loamy sand, sandy loam, loam, or clay loam
  Clay content—5 to 35 percent
  Rock fragment content—25 to 90 percent
  Reaction—neutral or slightly alkaline
**Bt horizon:**
- **Hue**—5YR or 7.5YR
- **Value**—3 to 5 dry; 2 to 3 moist
- **Chroma**—1 to 3, dry or moist
- **Texture**—loam, sandy clay loam, or clay loam
- **Clay content**—18 to 35 percent
- **Rock fragment content**—35 to 85 percent
- **Reaction**—neutral or slightly alkaline

**Diagnostic Features**
- Mollic epipedon—the zone from 0 to 10 inches (A and Bt horizons)
- Argillic horizon—the zone from 3 to 10 inches (Bt horizon)
- Depth to lithic contact—10 inches (R horizon)

**Description of Rock Outcrop**
This component consists of exposures of steep, flat, or rolling bedrock and cliffs. Areas are typically barren but may have sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material.

**90—Yesum gypsiferous fine sandy loam, saline, 0 to 3 percent slopes**

**Map Unit Setting**

*Landform(s):* Basin floors (fig. 122)

*Elevation:* 3,980 to 4,020 feet (1,213 to 1,225 meters)

*Mean annual precipitation:* 8 to 12 inches (203 to 305 millimeters)

*Mean annual air temperature:* 64 to 70 degrees F (18.0 to 21.0 degrees C)

*Mean annual soil temperature:* 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition
Yesum and similar soils: 98 percent
Minor components: 2 percent
  Lark and similar soils that have slopes ranging to 50 percent
  Typic Torripsamments
  Duneland

Description of the Yesum Soil
Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: Basin floors adjacent to parabolic dune fields
Parent material: Gypsiferous eolian deposits
Slope: 0 to 3 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—20 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent
  Physical cover:
    canopy plant cover—40 percent
    woody debris—5 percent
    bare soil—50 percent
    rock fragments—0 percent
Drainage class: Somewhat excessively drained
$K_{sat}$ (solum): 1.98 to 5.95 inches per hour (14.00 to 42.00 micrometers per second)
Available water capacity (total inches): 7.2 (high)
Shrink-swell potential: About 1.3 LEP (low)
Flooding hazard: None
Ponding hazard: Rare
Runoff class: Negligible
Hydrologic group: A
Ecological site name: Gyp Upland
Ecological site number: R042XB006NM
Present vegetation: Alkali sacaton, fourwing saltbush, jimmyweed, and pickleweed
Land capability classification (nonirrigated areas): 7c

Typical Pedon
Location by Geographic Coordinate System: lat. 32 degrees 47 minutes 18.40 seconds N. and long. 106 degrees 11 minutes 57.20 seconds W.

Ayyz—0 to 4.5 inches (0 to 12 centimeters); pink (7.5YR 7/4) gypsiferous fine sandy loam, light brown (7.5YR 6/4) moist; 12 percent clay; weak medium platy over weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and common fine roots throughout; few very fine and common fine interstitial pores; finely disseminated salt and gypsum throughout; noneffervescent, 0 percent calcium carbonate equivalent and 66 percent gypsum; moderately alkaline, pH 7.9; electrical conductivity of 16.4 dS/m (mmhos/cm); strongly saline; clear smooth boundary.
Byyz1—4.5 to 39 inches (12 to 99 centimeters); pink (7.5YR 7/3) gypsiferous fine sandy loam, light brown (7.5YR 6/4) moist; 14 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine roots throughout; few fine interstitial pores; finely disseminated salt, carbonate, and gypsum throughout; strongly effervescent, 5 percent calcium carbonate equivalent and 65 percent gypsum; moderately alkaline, pH 8.3; electrical conductivity of 17.0 dS/m (mmhos/cm); strongly saline; clear smooth boundary.

Byyz2—39 to 60 inches (99 to 152 centimeters); light brown (7.5YR 6/3) gypsiferous fine sandy loam, brown (7.5YR 5/3) moist; 16 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots throughout; few fine interstitial pores; finely disseminated salt, carbonate, and gypsum throughout; strongly effervescent, 6 percent calcium carbonate equivalent and 56 percent gypsum; moderately alkaline, pH 8.1; electrical conductivity of 15.8 dS/m (mmhos/cm); moderately saline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 10 to 16 percent

**Ayyz horizon:**
- Hue—7.5YR or 10YR
- Value—6 to 7 dry; 4 to 6 moist
- Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous loam
- Clay content—8 to 18 percent
- Calcium carbonate equivalent—0 to 2 percent
- Gypsum content—40 to 100 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—moderately saline or strongly saline
- Electrical conductivity—8 to 30 dS/m (mmhos/centimeters)

**Byyz horizons:**
- Hue—7.5YR or 10YR
- Value—6 to 7 dry; 5 to 6 moist
- Chroma—3 to 4, dry or moist
- Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous loam
- Clay content—8 to 18 percent
- Calcium carbonate equivalent—0 to 10 percent
- Gypsum content—40 to 100 percent
- Reaction—slightly alkaline or moderately alkaline
- Salinity—moderately saline or strongly saline
- Electrical conductivity—8 to 30 dS/m (mmhos/centimeters)

**Diagnostic Features**
- Ochric epipedon—the zone from 0 to 4.5 inches (Ayyz horizon)
- Gypsic horizon—the zone from 4.5 to 60 inches (Byyz1 and Byyz2 horizons)

**91—Yesum gypsiferous sandy loam, 0 to 9 percent slopes**

**Map Unit Setting**

*Landform(s):* Fan piedmonts (fig. 123)

*Elevation:* 3,920 to 5,000 feet (1,195 to 1,525 meters)
Mean annual precipitation: 8 to 12 inches (203 to 305 millimeters)
Mean annual air temperature: 64 to 70 degrees F (18.0 to 21.0 degrees C)
Mean annual soil temperature: 66 to 72 degrees F (19.1 to 22.1 degrees C)
Frost-free period: 180 to 240 days
Major Land Resource Area: 42—Southern Desertic Basins, Plains, and Mountains
Land Resource Unit: 42-2 Chihuahuan Desert Shrub

Map Unit Composition

Yesum and similar soils: 95 percent
Minor components: 5 percent
  Hermes and similar soils
  Nasa and similar soils

Description of the Yesum Soil

Taxonomic classification: Coarse-gypseous, hypergypsic, thermic Leptic Haplogypsids
Geomorphic position: Toeslopes of fan piedmonts
Parent material: Gypsiferous eolian deposits
Slope: 0 to 9 percent
Surface cover
  Biological crust:
    cyanobacteria—0 percent
    lichen—0 percent
    moss—0 percent
    cryptogamic crust—50 percent
  Chemical crust:
    salt—0 percent
    gypsum—0 percent

Figure 123.—An area of map unit 91 (Yesum gypsiferous sandy loam, 0 to 9 percent slopes).
Physical cover:
- canopy plant cover—20 percent
- woody debris—5 percent
- bare soil—30 percent
- rock fragments—0 percent

Drainage class: Well drained

$K_{sat}$ (solum): 0.57 inch to 5.95 inches per hour (4.00 to 42.00 micrometers per second)

Available water capacity (total inches): 6.0 (moderate)

Shrink-swell potential: About 1.2 LEP (low)

Flooding hazard: None

Runoff class: Low

Hydrologic group: B

Ecological site name: Gyp Upland

Ecological site number: R042XB006NM

Present vegetation: Alkali sacaton, fourwing saltbush, bush muhly, burrograss, and Torrey’s jointfir

Land capability classification (nonirrigated areas): 7c

Typical Pedon (fig. 124)

Location by Geographic Coordinate System: lat. 32 degrees 55 minutes 15.48 seconds N. and long. 106 degrees 8 minutes 42.03 seconds W.

Ayy—0 to 3.5 inches (0 to 9 centimeters); very pale brown (10YR 7/3) gypsiferous sandy loam, brown (10YR 5/3) moist; 15 percent clay; weak fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots throughout; few fine irregular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 3 percent calcium carbonate equivalent and 90 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 2.3 dS/m (mmhos/cm); very slightly saline; gradual smooth boundary.

Byy—3.5 to 10 inches (9 to 25 centimeters); very pale brown (10YR 8/3) gypsiferous very fine sandy loam, yellowish brown (10YR 5/4) moist; 8 percent clay; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few coarse and common fine roots throughout; common fine irregular pores; finely disseminated carbonate and many fine irregular gypsum crystals throughout; slightly effervescent, 2 percent calcium carbonate equivalent and 98 percent gypsum; moderately alkaline, pH 8.2; electrical conductivity of 4.8 dS/m (mmhos/cm); slightly saline; clear smooth boundary.

Byyz1—10 to 24.5 inches (25 to 62 centimeters); very pale brown (10YR 8/2) gypsiferous sandy loam, brownish yellow (10YR 6/6) moist; 10 percent clay; moderate coarse subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine roots throughout; common fine irregular pores; many fine irregular gypsum crystals throughout; noneffervescent, 83 percent gypsum; strongly alkaline, pH 8.5; electrical conductivity of 11.1 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Byyz2—24.5 to 51 inches (62 to 130 centimeters); very pale brown (10YR 8/2) gypsiferous sandy loam, brownish yellow (10YR 6/6) moist; 6 percent clay; weak coarse subangular blocky structure parting to moderate medium subangular blocky; moderately hard, friable, nonsticky, nonplastic; common very fine roots throughout; few fine irregular pores; many fine irregular gypsum crystals throughout; noneffervescent, 76 percent gypsum; strongly alkaline, pH 8.6; electrical conductivity of 12.1 dS/m (mmhos/cm); moderately saline; clear smooth boundary.

Byyz3—51 to 60 inches (130 to 152 centimeters); very pale brown (10YR 7/4) gypsiferous sandy loam, light yellowish brown (10YR 6/4) moist; 8 percent clay;
weak coarse subangular blocky structure parting to moderate medium subangular
blocky; moderately hard, friable, nonsticky, nonplastic; few very fine roots
throughout; few very fine irregular pores; many fine irregular gypsum crystals
throughout; noneffervescent, 90 percent gypsum; strongly alkaline, pH 8.6;
electrical conductivity of 14.2 dS/m (mmhos/cm); moderately saline.

**Range in Characteristics**

*Clay content of control section (weighted average):* 6 to 12 percent
Ayy horizon:
   Hue—7.5YR or 10YR
   Value—6 to 8 dry; 5 to 7 moist
   Chroma—2 to 4, dry or moist
   Texture—gypsiferous sandy loam or gypsiferous silt loam
   Clay content—10 to 17 percent
   Salinity—very slightly saline or slightly saline
   Gypsum content—70 to 90 percent

Byy and Byyz horizons:
   Hue—7.5YR or 10YR
   Value—6 to 8 dry; 4 to 6 moist
   Chroma—2 to 6, dry or moist
   Texture—gypsiferous sandy loam, gypsiferous fine sandy loam, or gypsiferous very fine sandy loam
   Clay content—6 to 17 percent
   Reaction—slightly alkaline to strongly alkaline
   Salinity—slightly saline or moderately saline
   Gypsum content—70 to 100 percent

Diagnostic Features
• Ochric epipedon—the zone from 0 to 3.5 inches (Ayy horizon)
• Gypsic horizon—the zone from 3.5 to 60 inches (Byy, Byyz1, Byyz2, and Byyz3 horizons)
Formation and Classification of the Soils

This section relates the soils of White Sands Missile Range to the major factors of soil formation and describes the system of soil classification.

Factors of Soil Formation

Soil covers the surface of the earth as a three-dimensional body of varying thickness and is made up of different proportions of organic and mineral material, pore space with gases, and water. Soils differ in their appearance, productivity, and management requirements due to their physical and chemical properties. The characteristics and properties of soils are determined by physical and chemical processes that result from the interaction of five soil-forming factors. These factors of soil formation are interdependent, and few generalizations can be made regarding any one factor unless the effects of the other factors are known. The term “pedogenesis” is often used to connote the processes of soil formation.

The interacting soil-forming factors are parent material, climate, organisms, time, and topography or relief. Parent material is the source material in which soils formed. Soils are influenced by the texture and structure of the parent material and its mineralogical and chemical composition. Climate is predominantly the temperature and kind and amount of precipitation. Climate is also seasonal distribution of temperature and precipitation. Organisms are the plants and other organisms living in and on the soil, including humans. Time refers to how long the soil-forming factors have been operating on a particular landscape. Relief or topography is the shape and elevation of the landscape. It affects internal and external soil properties, such as soil drainage, aeration, susceptibility to erosion, and the soil’s exposure to the sun and wind (Jenny, 1941).

Time

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. For example, young soils, such as Copia, Lark, and Queencreek, have had very little time to develop and lack diagnostic surface and subsurface horizons. These soils classify as Entisols.

Some soils have been stabilized long enough for weak diagnostic horizons, such as cambic horizons, to form. These soils may have pedogenic formation of carbonates or gypsum but have not been stable long enough for the carbonates or gypsum to accumulate and form calcic or gypsic diagnostic horizons. Pajarito and La Fonda soils have weakly expressed B horizons (cambic diagnostic subsurface horizons) but exhibit no other diagnostic features. These soils classify as Cambids.

Other soils, such as Dona Ana, Stagecoach, and Aerobee, are older than those listed above. They have developed soil structure and accumulations of clay, calcium carbonate, and gypsum that have formed argillic, calcic, and gypsic horizons.

Corvus, Del Norte, and Talos soils are among the oldest soils in the survey area and have very strongly developed diagnostic horizons, such as thick, well expressed...
argillic, petrocalcic, and/or petrogypsic horizons. These soils have been stable long enough for laminar caps to form on top of the petrocalcic and petrogypsic horizons.

Some soils 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 soil-forming factors (except parent material) are equal. However, as very few factors remain constant, they all must be considered when determining the formation and resulting morphology of a specific soil.

**Parent Material**

Parent material is the unconsolidated mineral and organic matter in which soil forms. Parent materials influence or wholly determine the color, texture, mineralogy, structure, consistency, reaction, erodibility, and natural fertility of soil. The main parent materials in the survey area are colluvium, alluvium, and eolian material.

**Colluvium** is material produced by the physical and chemical weathering and breakdown of parent rock. This material was moved by creep, slide, or local wash and deposited downslope. Deama soils, which formed in colluvium derived from limestone, have different properties than Woodcutter soils, which formed in colluvium derived from granite. The limestone-based Deama soils exhibit prominent calcic horizons and effervesce violently, whereas the granitic Woodcutter soils do not have calcic horizons and are noneffervescent throughout.

**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. Mimbres soils formed in geologically recent, medium textured alluvium. These soils have undergone change since the parent material was deposited and developed a weakly expressed B horizon. Pup soils formed in clayey alluvium. These soils are older, have strongly expressed gypsic horizons, and exhibit vertic properties, such as cracking from desiccation and slickensides along prism faces.

**Eolian material** is wind-deposited sand or silt. This material may once have been the surface layer of another soil before erosion and redeposition. Yesum soils are the most common and extensive soils that formed from eolian deposits. These soils formed in fine gypsiferous material that was derived from the main gypsum dune field and redeposited on the basin floor and fan piedmonts. Alumno-siliceous soils, such as Aguena, formed from sand that was blown out of the Jornada Del Muerto, over the San Andres Mountains, and deposited in steep, limestone valleys.

**Climate**

Climate has a significant influence on the kinds of soils 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 soil formation. When all other soil-forming 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 organic and inorganic materials. When the air temperature is low, the soil temperature is correspondingly low. Under this condition, the activity of plants and animals is reduced. 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 can form 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 other material that is blown in).

The difference between Bissett and Deama soils is primarily the result of climate. They both formed in colluvium derived from limestone. However, Deama soils, which are at cooler, higher elevations, receive more rainfall than Bissett soils, which are at warmer, lower elevations. Deama soils have a darker-colored surface layer that contains enough organic carbon to meet mollic epipedon requirements. This is a result of increased rainfall affecting vegetation, which in turn modifies the soil. Vegetation production on Deama soils is significantly higher than on Bissett soils. This increases the amount of dead biomass that is eventually incorporated into the soil.

**Topography**

Topography, mainly the steepness and aspect of slopes, affects soil development. The steepness 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. For example, Delnorte and Stagecoach soils commonly are gullied where slope is 15 to 35 percent but are not severely eroded where slope is 3 to 15 percent.

Aspect is the direction that the slope faces. A north-facing slope is cooler than a south-facing slope. Aspect affects the available heat present for soil development and the amount of available moisture, although these properties also depend upon other factors. This is especially evident near transition zones of temperature and moisture regimes.

Deama and Bissett soils occur in the same canyons within the San Andres Mountains and at the same elevation but differ because of aspect. The mesic Deama soils are on north aspects of mountain slopes. The vegetative community is pinyon-juniper woodland. Mollic epipedons form in soils on the cooler north-facing slopes. The thermic Bissett soils are across the canyon from Deama soils, on south-facing aspects. Because of the increased solar radiation on the south-facing slopes, soil temperature is higher, vegetation production is lower, and organic matter decomposition is increased. Mollic epipedons typically do not form in soils on south-facing aspects below the higher elevations, where temperatures are cool enough to overcome the effects of solar radiation.

**Plant and Animal Life**

Plant and animal life, including fungi, bacteria, earthworms, insects, rodents, vegetation, mammals, and humans, 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. The production of organic matter promotes the formation of structural units or aggregates. Roots also recycle nutrient elements from the lower soil layers to the upper soil layers. In addition, vegetation may regulate certain chemical reactions in the soil and the type of micro-organisms that are present.

Soils such as Flake and Peligro that formed in typic aridic, thermic temperature/moisture regimes in desert grass and shrub communities generally have a low content of organic matter. Desert grasses and shrubs are generally sparse, contribute little organic matter to the soil, and provide little shade and little protection against erosion.
Long periods of sunshine and heat cause the organic matter to decompose rapidly and oxidize.

Soils such as Penagua that formed in aridic ustic, mesic temperature/moisture regimes in woodland communities have a high content of organic matter. Trees, shrubs, and grasses shade and cool the soil. Cooler soil temperatures reduce the rate of organic matter decomposition.

**Classification of the Soils**

Soils are named and classified on the basis of physical and chemical properties in their horizons (layers). Color, texture, structure, and other properties of the soil to a depth of 2 meters are used to key the soil into a classification system. This system helps people to use soil information and also provides a common language for scientists.

Soils and their horizons differ from one another, depending on how and when they formed. Soil scientists use the five soil-forming factors to help predict where different soils may occur. The degree and expression of the soil horizons reflect the extent of interaction of the soil-forming factors with one or more of the soil-forming processes (Simonson, 1959).

When mapping soils, a soil scientist looks for areas with similar soil-forming factors to find similar soils. The properties of the soils are described. Soils with the same kind of properties are given taxonomic names. Soils are classified, mapped, and interpreted on the basis of various kinds of soil horizons and their arrangement. The distribution of soil orders corresponds with the general patterns of the soil-forming factors within the survey area.

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2010). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

**ORDER.** Soil taxonomy at the highest hierarchical level identifies 12 soil orders. The names for the orders and taxonomic soil properties relate to Greek, Latin, or other root words that reveal something about the soil. 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. Sixty-four suborders are recognized at the next level of classification. The last syllable in the name of a suborder indicates the order. An example is Argid (Arg, meaning illuvial horizon of silicate clay, plus *id*, from Aridisol).

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. There are about 300 great groups. 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*, indicating an appreciable accumulation of calcum carbonate, plus *argid*, the suborder of the Aridisols that has an illuvial horizon of silicate clay).

**SUBGROUP.** There are more than 2,400 subgroups. Each great group has a typic subgroup. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Other subgroups are intergrades or extragrades. 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 for family placement are those of horizons below a traditional agronomic plow depth. 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 soil series is the lowest category in the soil classification system. 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.
References


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Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the “National Soil Survey Handbook” (available in local offices of the Natural Resources Conservation Service or on the Internet).

`a`a lava. Hawaiian term for basaltic lava having a rough, jagged, clinkery surface and a vesicular interior.

`a`a lava flow. Basaltic lava flow dominated by `a`a lava that has a characteristically rough, jagged, clinkery surface. Compare to pahoehoe lava flow.

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. Pertaining to material or processes associated with transportation and/or subaerial deposition by concentrated running water. Compare to colluvial.

Alluvial fan. A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvial flat. As a colloquial term of western U.S.—a nearly level, graded, alluvial surface in bolsons and semi-bolsons which commonly does not manifest traceable channels, terraces, or flood-plain levels.

Alluvium. Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water. Compare to colluvium.

Anion. An ion carrying a negative charge of electricity. The common soil anions are phosphate, sulfate, nitrate, and chlorine.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction which a slope faces. Also called slope aspect.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at
wilting point. It is commonly expressed as inches of water per inch of soil. The
capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

<table>
<thead>
<tr>
<th>Level</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>0 to 3</td>
</tr>
<tr>
<td>Low</td>
<td>3 to 6</td>
</tr>
<tr>
<td>Moderate</td>
<td>6 to 9</td>
</tr>
<tr>
<td>High</td>
<td>9 to 12</td>
</tr>
<tr>
<td>Very high</td>
<td>More than 12</td>
</tr>
</tbody>
</table>

**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. They may or may not include cliff segments
(i.e., free faces). Backslopes are commonly erosional forms produced by mass
movement, colluvial action, and running water. Compare to summit, shoulder,
footslope, and toeslope.

**Bar (streams).** A general term for a ridge-like accumulation of sand, gravel, or other
alluvial material formed in the channel, along the banks, or at the mouth of a
stream where a decrease in velocity induces deposition.

**Barchan dune.** A crescent-shaped dune with tips extending leeward (downwind); the
leeward side is concave and the windward (upwind) side convex. Barchan dunes
tend to be arranged in chains extending in the dominant wind direction. Compare
to parabolic dune.

**Base saturation.** The degree to which material having cation-exchange properties is
saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a
percentage of the total cation-exchange capacity.

**Base slope (geomorphology).** A geomorphic component of hills consisting of the
concave to linear (perpendicular to the contour) slope that, regardless of the lateral
shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium
and slope-wash sediments (for example, slope alluvium). Distal base slope
sediments commonly grade to, or interfinger with, alluvial fills, or gradually thin to
form pedisediment over residuum. Compare to head slope, side slope, nose slope,
and interfluve.

**Basin.** (a) A drainage basin. (b) A low area of the Earth's crust, of tectonic origin, in
which sediments have accumulated. (c) As a colloquial term of western U.S.—the
nearly level to gently sloping, bottom surface of an intermontane basin (bolson).
Landforms include playas, broad alluvial flats containing ephemeral drainageways,
and relict alluvial and lacustrine surfaces that rarely, if ever, are subject to flooding.
Where through-drainage systems are well developed, flood plains are dominant
and lake plains are absent or of limited extent. Basin floors grade mountainward to
distal parts of piedmont slopes.

**Basin floor.** A general term for the nearly level, lowermost part of intermontane basins
(i.e., bolsons, semi-bolsons). The floor includes all of the alluvial, eolian, and
erosional landforms below the piedmont slope.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or
that is exposed at the surface. Compare to residuum.

**Blowout.** A saucer-, cup-, or trough-shaped depression formed by wind erosion on a
pre-existing dune or other sand deposit, especially in an area of shifting sand or
loose soil or where protective vegetation is disturbed or destroyed; the adjoining
accumulation of sand derived from the depression, where recognizable, is
commonly included. Blowouts are commonly small.

**Bolson.** As a colloquial term of western U.S.—an internally drained (closed)
intermontane basin into which drainages from surrounding mountains converge
inward toward a central depression. A semi-bolson is an externally drained (open)
bolson. Synonym: intermontane basin.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.
Breaks. A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

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.

Butte. An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by a summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks. Compare to mesa.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Calcic horizon. A horizon of calcium carbonate or calcium and magnesium carbonate accumulation.

Calcium carbonate equivalent. The quantity of carbonate (CO$_3$) in the soil expressed as CaCO$_3$ and as a weight percentage of the less than 2 millimeter size fraction.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

Cambic horizon. A horizon characterized by the formation of calcium carbonate coatings in root channels and on the surface of gravel. In some cases, clay bridges have begun to form between sand grains and clay films have begun to form in root channels.

Canopy. The leafy crown of trees or shrubs. See Crown.

Canyon. A long, deep, narrow valley with high, precipitous walls in an area of high local relief; similar to but larger than a gorge. A perennial stream is commonly at the bottom.

Canyonlands. A deeply and extensively dissected landscape composed predominantly of relatively narrow, steep-walled valleys with small flood plains or valley floors. The landscape commonly has considerable outcrops of hard bedrock on steep slopes, ledges, or cliffs and broader summits or interfluves than those in badlands. Side slopes exhibit extensive erosion, active back-wearing, and relatively sparse vegetation.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channel. (a) The hollow bed where a natural body of surface water flows or may flow. The deepest or central part of the bed of a stream, containing the main current and occupied more or less continuously by water. (b) As a colloquial term of western U.S.—the bed of a single or braided watercourse that commonly is barren and is formed of modern alluvium. Channels may be enclosed by banks or splayed.
across and slightly mounded above a fan surface and include bars and mounds of cobbles and stones. (c) As a microfeature—a small, trough-like, arcuate or sinuous channel separated by small bars or ridges, caused by fluvial processes; common to flood plains and young alluvial terraces; a constituent part of bar and channel topography.

**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.

**Chroma.** The relative purity, strength, or saturation of a color; directly related to the dominance of the determining wavelength of the light and inversely related to grayness; one of the three variables of color. See also Munsell notation.

**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.

**Cliff.** A high, very steep to perpendicular or overhanging face of rock or earth; a precipice.

**Climbing dune.** A dune formed by the piling-up of sand by wind against a cliff or mountain slope. It is very common in arid regions with substantial local relief and strong winds.

**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.

**Colluvial.** Pertaining to material or processes associated with transportation and/or deposition by mass movement (direct gravitational action) and local, unconcentrated runoff (overland flow) on side slopes and/or at the base of slopes. Compare to alluvial.

**Colluvium.** Unconsolidated, unsorted earth material that is transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff. Compare to alluvium, slope alluvium, and talus.

**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.** See Redoximorphic features.

**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 (geomorphology).** A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

**Corrosion (soil survey interpretations).** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

**Crest (geomorphology).** A geomorphic component of hills consisting of the convex slopes (perpendicular to the contour) that form the narrow, roughly linear top area of a hill, ridge, or other upland where shoulders have converged to the extent that little or no summit remains. A crest is dominated by erosion, slope wash, and mass movement processes and sediments (e.g., slope alluvium and creep). Commonly, soils on crests are more similar to those on side slopes than to those on adjacent interfluves.

**Crown.** The upper part of a tree or shrub, including the living branches and their foliage.

**Cryptogamic crust.** A type of microbiotic crust consisting of a thin, biotic layer at the ground surface composed predominantly of cryptogams (i.e., algae, mosses, lichens, and liverworts); most commonly found in semiarid or arid environments.

**Crystals.** Macro-crystalline forms of relatively soluble salts (e.g., halite, gypsum, and carbonates) that form **in situ** by precipitation from soil solution. The crystalline shape and structure is readily discernible in the field with a 10X hand lens.

**Cuesta.** An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks. Compare to mesa, dip slope, and scarp slope.

**Deflation.** The sorting out, lifting, and removal of loose, dry, fine grained soil particles (clays, silts, and fine sands) by the turbulent eddy action of the wind; a form of wind erosion.

**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.

**Deposition.** The laying down of any material by any agent, such as wind, water, or ice, or by other natural processes.

**Depression.** Any relatively sunken part of the Earth’s surface, especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage (e.g., a sinkhole). An open depression has a natural outlet for surface drainage.

**Depth, soil.** Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

**Desert pavement.** A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or
where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion. The coarse fragments commonly are cemented by mineral matter.

**Dip slope.** A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock (i.e., the long, gently inclined surface of a cuesta).

**Drainage class (natural).** Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the “Soil Survey Manual.”

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Drainageway.** A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel (e.g., head slope, swale) or that have a small, defined channel (e.g., low-order streams).

**Draw.** A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

**Dune.** A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand). It is either barren and capable of movement from place to place or is covered and stabilized with vegetation but still retaining its characteristic shape. See Barchan dune, Parabolic dune, Playa dune, Shrub-coppice dune, and Transverse dune.

**Dune field.** An assemblage of moving and/or stabilized dunes, together with sand plains, interdune areas, and the ponds, lakes, or swamps produced by the blocking of streams by the sand.

**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.

**Electrical conductivity (EC).** The conductivity of electricity through water or an extract of soil; the ability of the soil to conduct electricity. Commonly used to estimate the soluble salt content in solution.

**Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

**Endosaturation.** A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

**Eocene.** The epoch of the Tertiary Period of geologic time (from 35.4 to 56.5 million years ago). It immediately follows the Paleocene epoch and precedes the Oligocene epoch. Term also refers to the corresponding (time-stratigraphic) “series” of earthy materials.

**Eolian.** Pertaining to material transported and deposited by the wind. Includes clastic materials such as dune sands, sand sheets, loess deposits, and clay (e.g., parna).

**Eolian deposit (soil survey).** Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess. Conventionally, primary volcanic deposits (e.g., tephra) are considered separate.
Eolian sands (soil survey). Sand-sized, clastic material that is transported and deposited primarily by wind, commonly in the form of a dune or a sand sheet.

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. Compare to intermittent stream.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface. See also Endosaturation.

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.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Extrusive. Term used for igneous rocks and sediments derived from deep-seated molten matter (magma), deposited and cooled on the Earth’s surface. Examples are lava flows and tephra deposits.

Fan piedmont. The most extensive landform on piedmont slopes. It is formed by: (a) the lateral, downslope, coalescence of mountain-front alluvial fans into one generally smooth slope with or without the transverse undulations of the semi-conical alluvial fans and (b) accretions of fan aprons.

Fan remnant. A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, fan aprons, inset fans, and fan skirts, that either have been dissected (erosional fan remnants) or partially buried (nonburied fan remnants). An erosional fan remnant must have a relatively flat summit that is a relict fan surface. A nonburied fan remnant is a relict surface in its entirety.

Fault block. A displaced crustal unit, formed during block faulting, that is bounded by faults, either completely or in part, and behaves as a coherent unit during tectonic activity.

Fault-block mountains. Mountains that formed primarily by block faulting. They commonly exhibit asymmetrical rotation and vertical displacement from a horizontal plane by large, coherent fault-block units hinged along fault lines. They are common in, but not limited to, the Basin and Range region of the United States. The term is not applied to mountains formed by thrust-faulting.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain. Also called normal field capacity, normal moisture capacity, or capillary capacity.

Fine textured soil. Sandy clay, silty clay, or clay.

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.

Flat (geomorphology). (a) Term describing an area characterized by a continuous surface or stretch of land that is smooth, even, or horizontal, or nearly so, and that
lacks any significant curvature, slope, elevations, or depressions. (b) An informal, generic term for a level or nearly level surface or small area of land marked by little or no local relief.

**Flood plain.** The nearly level plain that borders a stream and is subject to flooding unless protected artificially. It is typically a constructional landform built of sediment deposited during overflow and lateral migration of the streams.

**Flooded.** Inundation by flowing water.

**Flood-plain step.** An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream (e.g., below the 100-year flood level); any approximately horizontal surface still actively modified by fluvial scour and/or deposition (i.e., cut and fill and/or scour and fill processes). Flood-plain steps may occur individually or as a series of steps.

**Fluvial.** Of or pertaining to rivers or streams; produced by stream or river action. Compare to alluvial and colluvial.

**Foothills.** A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters). Compare to hill and mountain.

**Footslope.** The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes). Compare to summit, shoulder, backslope, and toeslope.

**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.

**Geomorphic component.** A fundamental, three-dimensional piece or area of a geomorphic setting that has unique and prevailing kinetic energy dynamics and sediment transport conditions that result in characteristic forms, patterns of sedimentation, and soil development. Geomorphic components include flat plains, hills, mountains, and terraces.

**Geomorphic surface.** A mappable area of the Earth’s surface that has a common history; the area is of similar age and is formed by a set of processes during an episode of landscape evolution. A geomorphic surface can be erosional, constructional, or both. The surface shape can be planar, concave, convex, or any combination of these.

**Geomorphology.** The science that treats the general configuration of the Earth’s surface; specifically, the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures and of the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

**Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

**Graben.** An elongate trough or basin bounded on both sides by high-angle, normal faults that dip towards the interior of the trough. It is a structural form that may or may not be geomorphically expressed as a rift valley. Compare to horst.

**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.

**Grus.** The fragmental products of *in situ* granular disintegration of granite and granitic rocks, dominated by inter-crystal disintegration.

**Gully.** A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. Compare to rill, swale, and draw.

**Gypsic horizon.** A mineral soil horizon of secondary CaSO\(_4\) enrichment that is at least 15 centimeters or more thick, has at least 5 percent (50 g kg\(^{-1}\)) or more gypsum, and in which the product of the thickness in centimeters and the amount of CaSO\(_4\) is equal to or greater than 150 (1500 g kg\(^{-1}\)).

**Gypsum.** The common name for calcium sulfate.

**Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

**Hardpan.** A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**Head slope.** 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 (e.g., sheet wash). Head slopes are dominated by colluvium and slope wash sediments (e.g., slope alluvium); contour lines form concave curves. Slope complexity (downslope shape) can range from simple to complex. Head slopes are comparatively moister portions of hillslopes and tend to accumulate sediments (e.g., cumulic profiles) where they are not directly contributing materials to channel flow. Compare to side slope, nose slope, interfluve, crest, and base slope.

**Hill.** A generic term for an elevated area of the land surface, rising at least 30 meters (about 100 feet) to as much as 300 meters (about 1000 feet) above surrounding lowlands, commonly with a nominal summit area relative to bounding slopes, a well defined, rounded outline, and slopes that generally exceed 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage. Compare to mountain and foothills.

**Hillslope-profile position.** Discrete slope segments found along a transect line that runs perpendicular to the contour, beginning at a divide and descending to a lower, bounding stream channel or valley floor; a discrete piece of a two-dimensional cross profile of a hill. Positions are commonly separated from one another by inflection points along the line. In descending elevational order, the hillslope-profile positions of a simple hillslope include summit, shoulder, backslope, footslope, and toeslope. Not all of these segments (positions) are necessarily present along a particular hillslope. Complex hillslopes include multiple sequences or partial sequences.

**Holocene.** The epoch of the Quaternary Period of geologic time following the Pleistocene epoch (from the present to about 10,000 to 12,000 years ago). Term also refers to the corresponding (time-stratigraphic) “series” of earthy materials.

**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:
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.

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.

Horst. An elongate block that is bounded on both sides by normal faults that dip away from the interior of the horst. It is a structural form and may or may not be expressed geomorphically.

Hue. A measure of the chromatic composition of light that reaches the eye; one of the three variables of color. See also Munsell notation.

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 that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., 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.

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:

<table>
<thead>
<tr>
<th>Rate Range</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.2</td>
<td>very low</td>
</tr>
<tr>
<td>0.2 to 0.4</td>
<td>low</td>
</tr>
<tr>
<td>0.4 to 0.75</td>
<td>moderately low</td>
</tr>
<tr>
<td>0.75 to 1.25</td>
<td>moderate</td>
</tr>
<tr>
<td>1.25 to 1.75</td>
<td>moderately high</td>
</tr>
<tr>
<td>1.75 to 2.5</td>
<td>high</td>
</tr>
<tr>
<td>More than 2.5</td>
<td>very high</td>
</tr>
</tbody>
</table>
Interbedded. Term indicating beds lying between or alternating with others of different character, especially rock material or sediments laid down in sequence between other beds. For example: interbedded sands and gravel.

Interdune. The relatively flat surface, either sand-free or sand covered, between dunes.

Interfluve. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology). A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape. Compare to crest, side slope, head slope, nose slope, and base slope.

Intermittent stream. A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources. Compare to ephemeral stream.

Intrusive. Term for igneous rocks derived from molten matter (magma) that invaded pre-existing rocks and cooled below the surface of the Earth. Compare to extrusive.

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.

Iron depletions. See Redoximorphic features.

Kipuka. A low “island” of land surrounded by a younger (more recent) lava flow.

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.

Lakebed. (a) If relict, the flat to gently undulating ground underlain or composed of fine grained sediments deposited in a former lake. (b) The bottom of a lake; a lake basin.

Landform. Any physical, recognizable form or feature on the Earth’s surface, having a characteristic shape and range in composition, and produced by natural causes. A landform can span a wide range in size (e.g., dune encompasses both parabolic dunes, which can be several tens-of-meters across, as well as seif dunes, which can be up to 100 kilometers long). Landforms provide an empirical description of similar portions of the Earth’s surface.

Landscape. An assemblage, group, or family of spatially related, natural landforms over a relatively large area; the land surface which the eye can comprehend in a single view.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava. A general term for a molten extrusive; also the rock solidified from it.

Lava flow. A solidified body of rock formed from the lateral, surficial outpouring of molten lava from a vent or fissure. It is commonly lobate in form. Compare to `a`a lava flow and pahoehoe lava flow.

Lava tube. A natural, hollow tunnel beneath the surface of a solidified lava flow through which the lava flow was fed. The tunnel was left empty when the molten lava drained out.

Limestone. A sedimentary rock consisting chiefly (more than 50 percent) of calcium carbonate, primarily in the form of calcite. Limestone is typically formed by a
combination of organic and inorganic processes and includes chemical and clastic (soluble and insoluble) constituents; many contain fossils.

**Linear extensibility.** Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $\frac{1}{3}$-, or $\frac{1}{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

**Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Low strength.** The soil is not strong enough to support loads.

**Lunette.** See Playa dune.

**Major land resource areas (MLRAs).** These are geographically associated land resource units (LRUs). Identification of these large areas is important in statewide agricultural planning as well as in interstate, regional, and national planning.

**Masses.** See Redoximorphic features.

**Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.

**Mesa.** A broad, nearly flat-topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments. As a colloquial term of western U.S. (not preferred)—a broad structural bench or alluvial terrace that occupies intermediate levels in stepped sequences of platforms bordering canyons and valleys.

**Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the Earth’s crust. Nearly all such rocks are crystalline. Examples are schist, gneiss, quartzite, slate, and marble.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

**Miocene.** The epoch of the Tertiary Period of geologic time (from approximately 5.2 million to 23 million years ago), immediately following the Oligocene epoch and preceding the Pliocene epoch. Term also refers to the corresponding (time-stratigraphic) “series” of earthy materials.

**Miscellaneous area.** A kind of map unit that has little or no natural soil and supports little or no vegetation.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Mollisol.** 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).

**Mound.** A low, rounded natural hill of unspecified origin, generally less than 3 meters
high and composed of earthy material.

**Mountain.** A generic term for an elevated area of the land surface, rising more than
1,000 feet (300 meters) above surrounding lowlands, commonly of restricted
summit area (relative to a plateau) and generally having steep sides. A
mountain can occur as a single, isolated mass or in a group forming a chain or
range. Mountains are formed primarily by tectonic activity and/or volcanic action
but can also be formed by differential erosion. Compare to hill, foothills, and
mountains.

**Mountainbase.** A geomorphic component of mountains consisting of the lowermost
area (the strongly to slightly concave colluvial apron or wedge at the bottom of
mountain slopes). A mountainbase is composed of long-transport colluvium
and slope alluvium sediment. It can extend out onto more level valley areas
where it ultimately interfingers with or is buried by alluvium or is replaced by re-
emergent residuum. Compare to mountaintop, mountainflank, and geomorphic
component.

**Mountainflank.** A geomorphic component of mountains consisting of the side area of
mountains. A mountainflank is characterized by very long, complex backslopes
with comparatively high slope gradients. It is composed of very diverse, colluvial
sediment mantles, has complex near-surface hydrology, and has mass movement
processes and features (e.g., creep, landslides); rock outcrops or structural
benches may be present. The mountainflank can be subdivided by the general
location along the mountainside (i.e., upper third, middle third, or lower third
mountainflank). Compare to mountaintop, mountainbase, and geomorphic
component.

**Mountains.** A region or landscape characterized by mountains and the intervening
valleys; a generic name for any group, cluster, or sequence of mountains or
narrowly spaced mountain ridges, with or without peaks, closely related in position,
orientation, direction, formation, or age, and whose summits commonly exceed
300 meters (approximately 1,000 feet).

**Mountain slope.** A part of a mountain between the summit and the footslope.
Compare to mountainflank and hillslope.

**Mountaintop.** A geomorphic component of mountains consisting of the uppermost,
comparatively level or gently sloping area of mountains, characterized by relatively
short, simple slopes composed of bare rock, residuum, or short-transport colluvial
sediments. In humid environments, mountaintop soils can be very thick and
well developed. Compare to mountainflank, mountainbase, and geomorphic
component.

**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.

**Nodules.** See Redoximorphic features.

**Nose slope (geomorphology).** A geomorphic component of hills consisting of the
projecting end (laterally convex area) of a hillside. The overland waterflow is
predominantly divergent. Nose slopes consist dominantly of colluvium and slope-
wash sediments (for example, slope alluvium). Compare to head slope, side slope,
interfluve, crest, and base slope.

**Ochric epipedon.** A surface horizon of mineral soil that is too light in color, has too
high a chroma, has too low a content of organic carbon, or is too thin to be a
plaggan, mollic, umbric, anthropic, or histic epipedon; or a surface horizon that is
both hard and massive when dry.
Oligocene. The epoch of the Tertiary Period of geologic time (from 23.3 to 35.4 million years ago), following the Eocene epoch and preceding the Miocene epoch. Term also refers to the corresponding (time-stratigraphic) "series" of earthy materials.

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

Outcrop. (a) That part of a geologic formation or structure that appears at the surface of the Earth. (b) As used in soil survey—the exposure of bedrock at or above the ground surface. Compare to cliff.

Pahoehoe lava. Basaltic lava that has a characteristically smooth, billowy or rope-like surface and vesicular interior. Compare to `a`a lava.

Pahoehoe lava flow. Basaltic lava flow that has a characteristically smooth, billowy or rope-like surface. Compare to `a`a lava flow.

Paleocene. The earliest epoch of the Tertiary Period of geologic time (from 56.5 to 65.0 million years ago), immediately following the Cretaceous Period and preceding the Eocene epoch. Term also refers to the corresponding (time-stratigraphic) “series” of earthy materials.

Parabolic dune. A sand dune with a long, scoop-shaped form, convex in the downwind direction so that its horns point upwind. Its ground plan, when perfectly developed, approximates the form of a parabola.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pediment. A gently sloping erosional surface developed at the foot of a receding hill or mountain slope. The surface may be essentially bare, exposing earth material that extends beneath adjacent uplands; or it may be thinly mantled with alluvium and colluvium.

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.

Pennsylvanian (geology). The period of geologic time from 318 million to 300 million years ago.

Perculation. 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
Permian. The period of geologic time from 300 million to 251 million years ago.

Petrocalcic horizon. A continuous or fractured calcic horizon indurated or cemented by carbonates and some silica. Compare to caliche.

Petrogypsic horizon. A continuous, massive gypsic horizon that is cemented by calcium sulfate. It can be chipped with a spade when dry. It is impenetrable to roots, and dry fragments do not slake in water.

Petronodes. See Nodules.

pH value. A numerical designation of acidity and alkalinity in soil. See Reaction, soil.

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piedmont. (a) As an adjective—lying or formed at the base of a mountain or mountain range; e.g., a piedmont terrace or a piedmont pediment. (b) As a noun—a plain, slope, glacier, or other feature at the base of a mountain; e.g., a foothill or a bajada. In the U.S., the Piedmont is a low plateau extending from New Jersey to Alabama and lying east of the Appalachian Mountains.

Piedmont slope. As a colloquial term of western U.S.—the dominant gentle slope at the foot of a mountain; generally used with intermontane-basin terrain in arid to subhumid regions. Its main components include: (a) an erosional surface on bedrock adjacent to the receding mountain front (pediment or rock pediment); (b) a constructional surface comprising individual alluvial fans and interfan valleys, also near the mountain front; and (c) a distal complex of coalescent fans (bajada) and alluvial slopes without fan form. Piedmont slopes grade to basin-floor depressions with alluvial and temporary lake plains or to surfaces associated with through drainage (e.g., axial streams). Compare to bolson and fan piedmont.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Playa. The typically dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those occurring on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation-runoff events. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Playa dune. As a colloquial term of the Southern High Plains—a linear or curvilinear ridge of windblown, granular material (generally sand or panna) removed from the adjacent basin by wind erosion (deflation) and deposited on the leeward (prevailing downwind) margin of a playa, playa basin, or saline basin. The dune may be barren or vegetated. Compare to dune.

Playa step. As a colloquial term of the Southern High Plains—the relatively level or gently inclined terrace-like bench or toeslope within a large playa basin flanking and topographically higher than the playa floor and below the playa slope; a bench or steplike surface within a playa basin that breaks the continuity of the playa slope and is modified by erosion and/or deposition. Temporary ponding may occur in response to precipitation-runoff events.

Pleistocene. The epoch of the Quaternary Period of geologic time (from about 10 to 12 thousand to 2.6 million years ago), following the Pliocene epoch and preceding the Holocene. Term also refers to the corresponding (time-stratigraphic) “series” of earthy materials.

Pliocene. The last epoch of the Tertiary Period of geologic time (from 1.6 to 5.2 million years ago), following the Miocene epoch and preceding the Pleistocene epoch. Term also refers to the corresponding (time-stratigraphic) “series” of earthy materials.
Pluvial lake. A lake formed in a period of exceptionally heavy rainfall; a lake formed in the Pleistocene epoch during a time of glacial advance and now either extinct (relict) or existing as a remnant (lake), e.g., Lake Bonneville.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings. See Redoximorphic features.

Potential 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.

Precambrian. The period of geologic time from 4.5 billion to 542 million years ago.

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.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed as pH values.

A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

- Ultra acid .................................................. less than 3.5
- Extremely acid ........................................... 3.5 to 4.4
- Very strongly acid ........................................ 4.5 to 5.0
- Strongly acid ................................................ 5.1 to 5.5
- Moderately acid ............................................ 5.6 to 6.0
- Slightly acid ................................................ 6.1 to 6.5
- Neutral ......................................................... 6.6 to 7.3
- Slightly alkaline ........................................... 7.4 to 7.8
- Moderately alkaline ..................................... 7.9 to 8.4
- Strongly alkaline ......................................... 8.5 to 9.0
- Very strongly alkaline .................................. 9.1 and higher

Redoximorphic concentrations. See Redoximorphic features.

Redoximorphic depletions. See Redoximorphic features.

Redoximorphic features. Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; and
B. Masses, which are noncemented concentrations of substances within the soil matrix; and
C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.

2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; and
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeleton).

3. Reduced matrix.—This is a soil matrix that has low chroma in situ but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix. See Redoximorphic features.

Relief. The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place. Compare to alluvium and colluvium.

Ridge. A long, narrow elevation of the land surface, typically sharp-crested with steep sides, that forms an extended upland between valleys. The term is used in areas of both hill and mountain relief.

Rift valley. A valley that has developed along a long, narrow continental trough that has down-dropped and is bounded by normal faults; a graben of regional size. A rift valley marks part of a zone along which the entire thickness of the lithosphere has ruptured under crustal extension.

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.

Rise (geomorphology). A geomorphic component of flat plains (e.g., lake plain, low coastal plain, and low-gradient till plain) consisting of a slightly elevated but low, broad area with low slope gradients (e.g., 1 to 3 percent). A rise is typically a microfeature but can be fairly extensive. Soils on a rise are commonly better drained than those on the surrounding taf. Compare to taf.

Riser (geomorphology). A geomorphic component of terraces, flood-plain steps, and other stepped landforms consisting of the vertical or steep side slope (e.g., escarpment) typically of minimal aerial extent. Commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces. Its characteristic shape and alluvial sediment composition are derived from the cut and fill processes of a fluvial system.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called groundwater runoff or seepage flow from ground water.

Salic horizon. A mineral or hypergypsic soil horizon of enrichment with secondary salts more soluble in cold water than gypsum.
Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The degree to which a soil is affected by soluble salts. The amount of total salts in the soil is ascertained by measuring the conductivity of a saturated soil extract. The conductivity is measured in decisiemens per meter (dS/m), which are the same as millimhos per centimeter (mmhos/cm). Classes of salinity are nonsaline, 0 to 2 dS/m; very slightly saline, 2 to 4 dS/m; slightly saline, 4 to 8 dS/m; moderately saline, 8 to 16 dS/m; and strongly saline, 16 to 32 dS/m.

Salt marsh. A flat, poorly drained area that is subject to periodic or occasional overflow by salt water. It contains brackish to strongly saline water and is usually covered with a thick mat of grassy halophytic plants. For example, a coastal marsh periodically flooded by the sea, or an inland marsh, in an arid region and subject to intermittent overflow by salty water.

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.

Sand sheet. A large, irregularly shaped, commonly thin, surficial mantle of eolian sand, lacking the discernible slip faces that are common on dunes.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sanitary landfill. A land area where municipal solid waste is buried and compacted and ultimately covered with soil or other earthy material.

SAR. See Sodium adsorption ratio.

Saturated hydraulic conductivity (K_s). See Permeability.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarp. An escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or structural bench. A scarp may be of any height.

Scarp slope. The relatively steeper face of a cuesta, facing in a direction opposite to the dip of the strata.

Sedimentary rock. A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the Earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

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.

Sewage lagoon. Any artificial pond or other water-filled excavation used for the natural oxidation of sewage or disposal of animal manure.

Shale. Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope. Compare to summit, crest, backslope, footslope, and toeslope.

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, streamlined dune that forms around brush and clump vegetation.
Side slope (geomorphology). A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments. Slope complexity (downslope shape) can range from simple to complex. Compare to head slope, nose slope, interfluve, crest, and base slope. As used in the Southwest, the slope bounding a drainageway and lying between the drainageway and the adjacent interfluve. It is generally linear along the slope width.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. An indurated silt having the texture and composition of shale but lacking its fine laminations or fissility; a massive mudstone in which silt predominates over clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickensides (pedogenic). Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium. Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits. Compare to colluvium.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na⁺ to Ca++ + Mg++. The degrees of sodicity and their respective ratios are:

- Slight ...........................................less than 13:1
- Moderate  .......................................13-30:1
- Strong ..........................................more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soil. A natural, three-dimensional body at the Earth’s surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:
Supplement to the Soil Survey of White Sands Missile Range, New Mexico

<table>
<thead>
<tr>
<th>Particle Size</th>
<th>Percent of Total Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very coarse sand</td>
<td></td>
</tr>
<tr>
<td>Coarse sand</td>
<td></td>
</tr>
<tr>
<td>Medium sand</td>
<td></td>
</tr>
<tr>
<td>Fine sand</td>
<td></td>
</tr>
<tr>
<td>Very fine sand</td>
<td></td>
</tr>
<tr>
<td>Silt</td>
<td></td>
</tr>
<tr>
<td>Clay</td>
<td></td>
</tr>
</tbody>
</table>

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

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.

Stratified. Formed, arranged, or laid down in layers. Term refers to geologic deposits. Layers in soils inherited from the parent material are called strata; those that result from the processes of soil formation are called horizons.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Strike slope. See Scarp slope.

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 grain (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. (a) The topographically highest position of a hillslope profile with a nearly level (planar or only slightly convex) surface. Compare to shoulder, backslope, footslope, toeslope, and crest. (b) A general term for the top, or highest area of a landform, such as a hill, mountain, or tableland. It usually refers to a high interfluve area with a relatively gentle slope that is flanked by steeper slopes, e.g., mountain fronts or tableland escarpments.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A shallow, open depression in unconsolidated materials that lacks a defined channel but can funnel overland or subsurface flow into a drainageway. Soils in swales tend to be moister and thicker (cumulic) compared to surrounding soils.

Talf. A geomorphic component of flat plains (e.g., lake plain, low coastal plain, and low-gradient till plain) consisting of an essentially flat (e.g., slope of 0 to 1 percent), broad area dominated by closed depressions and a non-integrated or poorly integrated drainage system. Precipitation tends to pond locally, and lateral transport is slow both above and below ground. Compare to rise.

Talus. Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.
Talus slope. A portion of a hillslope or mountain slope mantled by talus and lying below a rockfall source (e.g., cliff).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace (geomorphology). A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion. Compare to stream terrace and flood-plain step.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Tertiary. The period of the Cenozoic Era of geologic time (approximately from 65 to 1.6 million years ago). Subdivisions, in order of increasing age, are Pliocene, Miocene, Oligocene, Eocene, and Paleocene.

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, silt, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Toeslope. The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors. Compare to summit, shoulder, backslope, and footslope.

Transverse dune. An asymmetric sand dune that is elongated perpendicular to the prevailing wind direction and has a gentle windward slope and a steep leeward slope standing at or near the angle of repose of sand. A transverse dune generally forms in areas of sparse vegetation. Compare to barchan dune and parabolic dune.

Valley. An elongate, relatively large, externally drained depression of the Earth’s surface that is primarily developed by stream erosion or glacial activity. Compare to basin.

Value, color. The degree of lightness or darkness of a color in relation to a neutral gray scale; one of the three variables of color. On a neutral gray scale, value extends from pure black to white. See also Munsell notation.

Weathering. All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the Earth’s surface by atmospheric or biologic agents or by circulating surface waters, but involving essentially no transport of the altered material.

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.
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