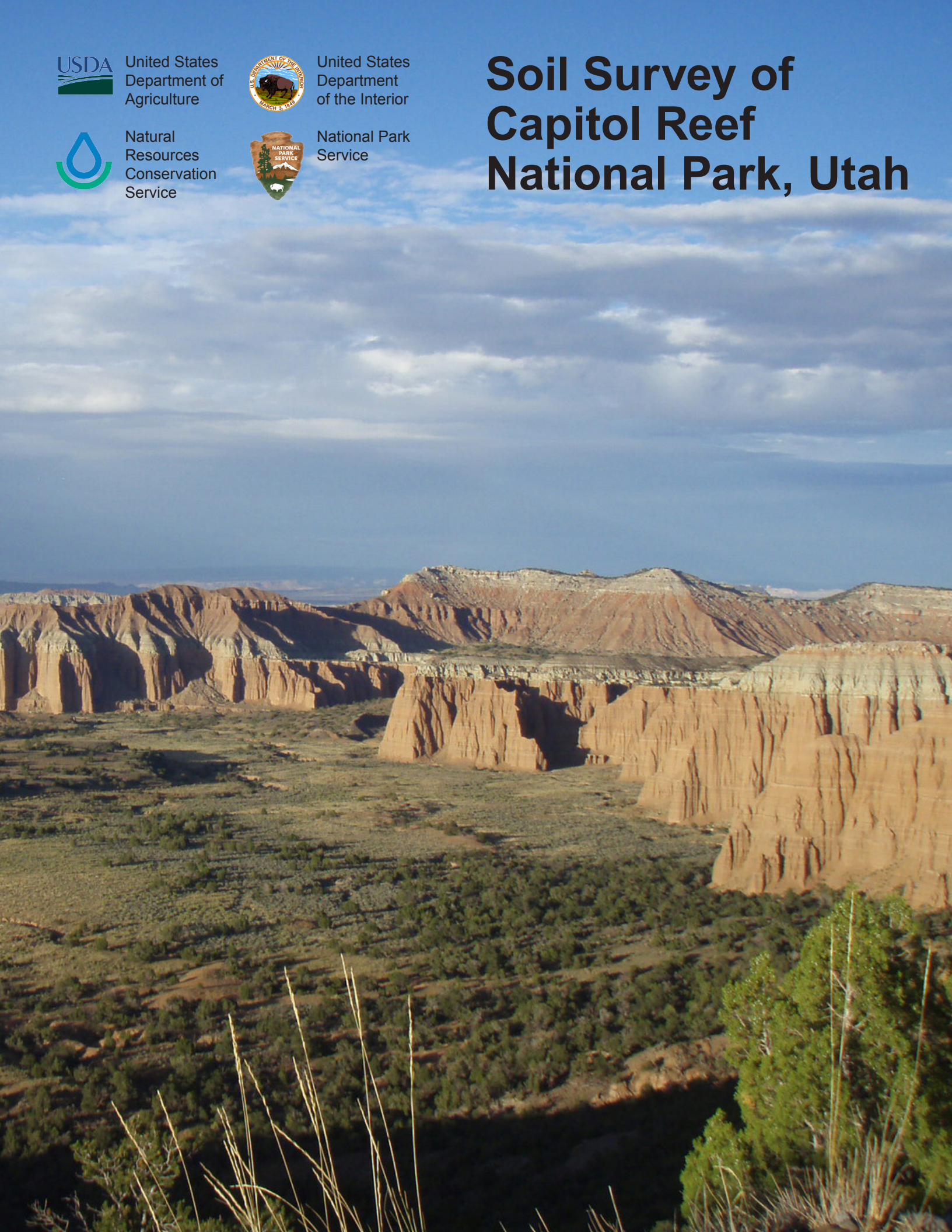
United States Department of Agriculture

United States Department of the Interior

Natural Resources Conservation Service

National Park Service

Soil Survey of Capitol Reef National Park, Utah



How To Use This Soil Survey

General Soil Map

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

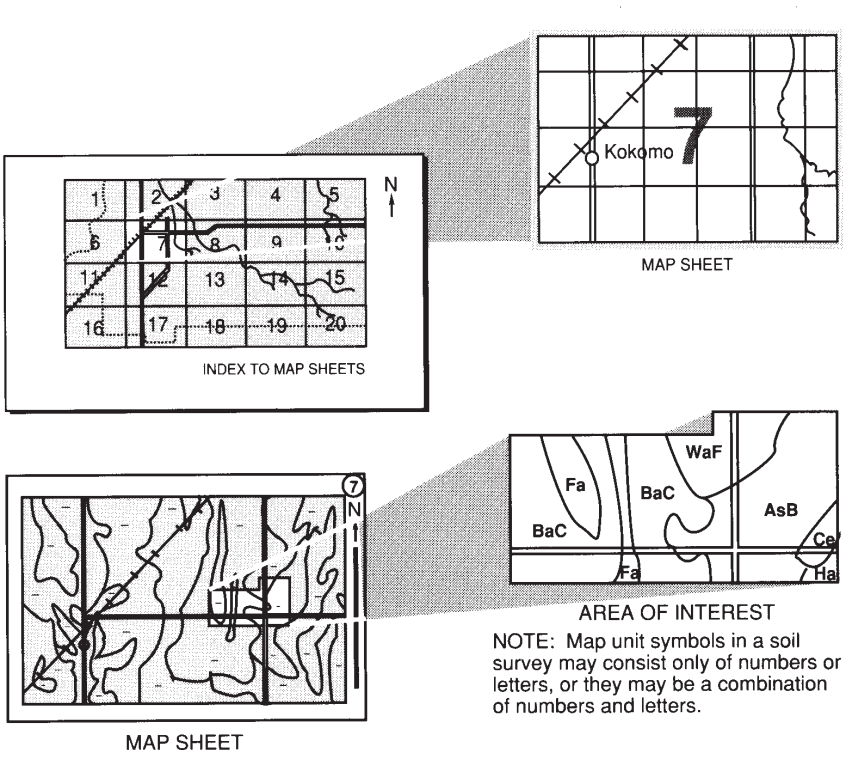
Detailed Soil Maps

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

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

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

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



National Cooperative Soil Survey

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

Major fieldwork for this soil survey was completed in 2011. 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 Natural Resources Conservation Service and the National Park Service.

The soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, the maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Literature Citation

The correct citation for this survey is as follows:

United States Department of Agriculture, Natural Resources Conservation Service, and United States Department of the Interior, National Park Service. 2014. Soil survey of Capitol Reef National Park, Utah. (Accessible online at: http://soils.usda.gov/survey/printed_surveys/)

Cover Caption

View of Cathedral Valley, looking northeast from near the Cathedral Valley campground. The valley floor is mapped Begay, saline-sodic-Begay, moist-Elias complex, 2 to 8 percent slopes. The escarpments and buttes are mapped Remorris, strongly alkaline-Rock outcrop complex, 30 to 70 percent slopes. The hillslope in the near foreground is mapped Milok, steep-Strych complex, 15 to 60 percent slopes.

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

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Issued 2014

Foreword

This soil survey was developed in conjunction with the National Park Service's Soil Inventory and Monitoring Program and is intended to serve as the official source document for soils occurring within Capitol Reef National Park, Utah.

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

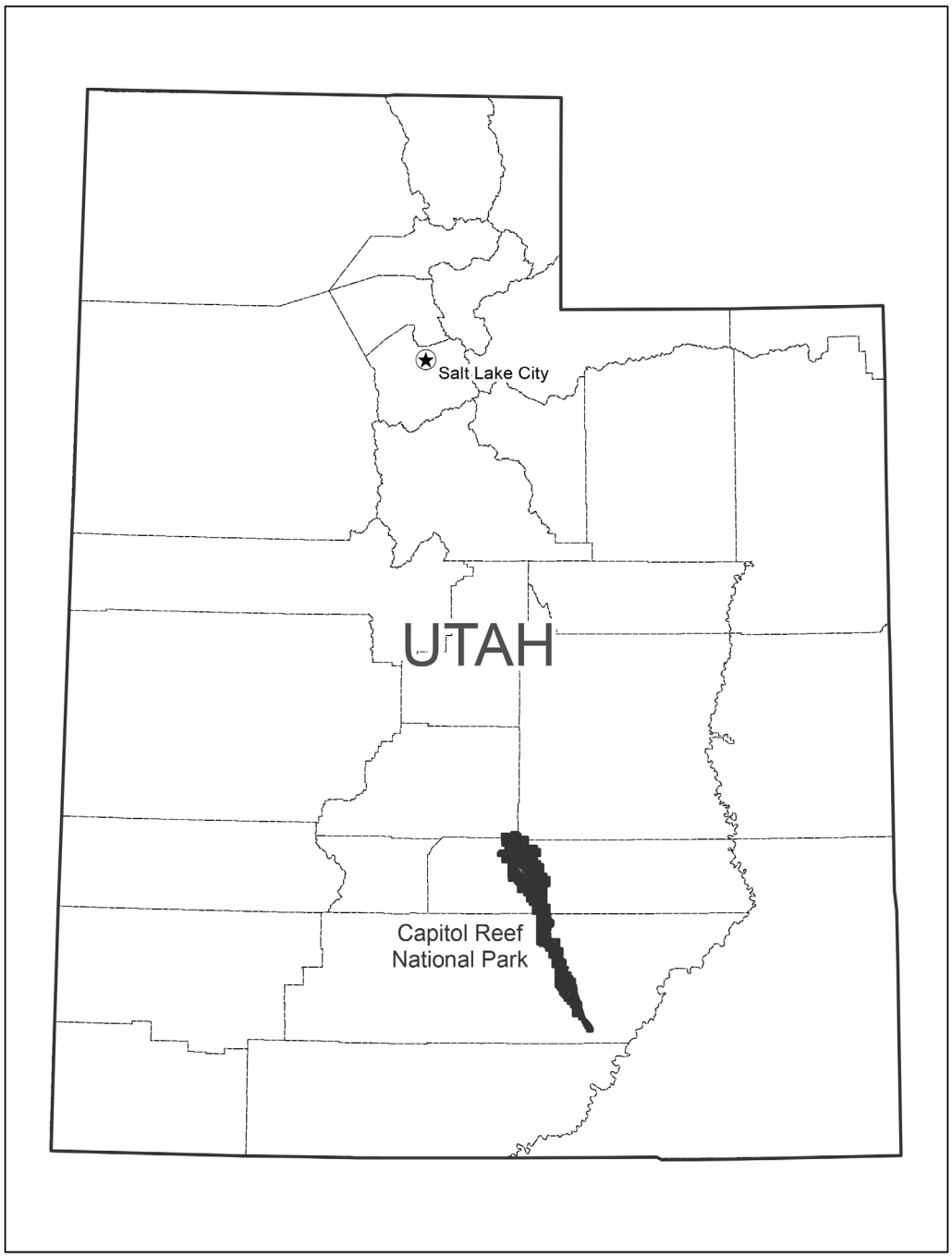
Soil surveys are designed for many different users. Farmers, ranchers, foresters, and agronomists can use the surveys to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the surveys to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the surveys to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each map unit is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or Cooperative Extension Service or at the National Park Service's Natural Resources Program Center.

David Brown
State Conservationist
Natural Resources Conservation Service



Location of Capitol Reef National Park in Utah

Soil Survey of
Capitol Reef National Park, Utah

By Catherine E. Scott, Natural Resources Conservation Service

Fieldwork by Catherine E. Scott, Keith W. Crossland, and Juliet B. Baker,
Natural Resources Conservation Service

Ecological site assessment by Jacob M. Owens, Jamin Johanson, and
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United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
United States Department of Interior, National Park Service

Capitol Reef National Park is in south-central Utah and is 241,904 acres in size. It is located in the central parts of Wayne and Garfield Counties, in the southeast corner of Sevier County, and in the southwest corner of Emery County. It is bounded by Glen Canyon National Recreation Area on the south, Grand Staircase-Escalante National Monument to the west, the Fishlake and Dixie National Forests to the north and west, and Henry Mountains Resource Area to the east.

Capitol Reef National Park (Capitol Reef NP) is irregular in shape and consists of monoclines, mesas, structural benches, canyons, river terraces, and flood plains.

Under the NRCS land classification system, the United States is divided into regions known as major land resource areas (MLRAs). MLRAs are distinguished by regional climate, soils, geology, water, topography, and predominant plant communities characteristic of the region. Capitol Reef National Park is within MLRA 35—Colorado and Green River Plateaus. MLRA 35 occurs in Arizona (56 percent), Utah (22 percent), New Mexico (21 percent), and Colorado (1 percent). It makes up about 71,735 square miles (185,885 square kilometers). The cities of Kingman and Winslow, Arizona; Gallup and Grants, New Mexico; and Kanab and Moab, Utah, are in this area. The Grand Canyon and Petrified Forest National Parks and the Canyon de Chelly and Wupatki National Monuments are in the Arizona part of this MLRA. The Zion, Capitol Reef, Canyonlands, and Arches National Parks and the Grand Staircase-Escalante and Hovenweep National Monuments are in the Utah part. The Aztec Ruins, El Morro, El Malpais, and Chaco Canyon National Monuments and Chaco Culture National Historic Park are in the New Mexico part. Currently, MLRA 35 in Utah is not subdivided by land resource units (LRUs).

The roads inside the park range from unimproved gravel and dirt roads to paved highways. State Highway 24 runs east and west through the park, and Scenic Drive runs south from the highway to Capitol Gorge. Several improved gravel roads run north into Cathedral Valley and south to Bullfrog, Utah. Burr Trail runs east and west through the park. Many hiking trails provide access to the most remote areas of the park and vary from easy to strenuous.

No cities or towns are located within the park. Torrey, Utah (population 171) lies about 5 miles to the west, and Hanksville (population 219) is about 20 miles to the east. The area between these towns is extremely rural with widely scattered ranches.

Capitol Reef NP includes the Fruita Rural Historic District, an important orchard area. This area is contained within two canyons that intersect at the confluence of Sulphur Creek and the Fremont River below the dark red massive sandstone of Wingate Cliffs. Utah Highway 24 traverses Fruita from east to west, and the park's scenic drive runs north to south. The Fremont River and Sulphur Creek originate on Thousand Lake Mountain to the northwest of Fruita. Soil and leaf samples were collected in the Fruita orchards for nutrient analysis during 2011. Soil samples were collected in the spring of 2011 for two depths, and leaf samples were collected in the summer of 2011. See the report "Analytical Nutrient Results for Soils of Fruita Orchards" accompanying this soil survey for more information.

General Nature of the Survey Area

This section discusses the history, physiography, climate, vegetation, and geology of the park.

History

The first inhabitants of the area currently encompassed by the park were Native Americans. According to evidence, these people (known as the Fremont Culture) date back to the 9th century. They lived in the area until around 1500. The first white explorers in the area reported encountering bands of Ute and Southern Paiute Native American tribes. Mormon settlers moved into the Capitol Reef area in the 1880s and established communities along the Fremont River. One of these settlements, named Junction (and later renamed Fruita), was established at the junction of the Fremont River and Sulphur Creek.

The Capitol Reef area was called "Wayne Wonderland" by local promoters in the 1920s. In 1937, President Roosevelt designated 37,711 acres as a national monument. In 1962, a paved road was built through the Fremont River Gorge, which dramatically increased visitation to the monument. On December 18, 1971, Congress established Capitol Reef National Park through Public Law 92-207.

Physiography

Capitol Reef National Park is located in the Colorado Plateaus Province of the Intermontaine Plateaus. Elevation ranges from about 3,800 feet on lower Halls Creek at the south end of the park to about 8,800 feet on Dry Bench and in the northwest corner of the park. Four relatively small perennial water courses (Pleasant, Oak, and Sulphur Creeks and the Fremont River) flow easterly from the high western mountains and plateaus through the park (and the Waterpocket Fold monocline), out the east side of the park, and eventually into Lake Powell. Many natural water sources are intermittent in nature and include numerous springs and seeps. Water also collects in bedrock potholes after rains. Most of the washes have water only after significant rainfall.

The Cathedral Valley district is located in the northern portion of the park. Just to the west of the park boundary is Thousand Lake Mountain, a volcanic plateau covered with black basaltic boulders. Jones Bench and Cathedral Campground occupy parts of the lower flank of this mountain. The area known as the Middle Desert includes Upper and Lower Cathedral Valleys, which are connected via Middle Desert Wash. Upper Cathedral Valley has striking natural features, such as Cathedral Mountain and the Gypsum Sinkhole. The Temples of the Sun and Moon and Glass Mountain are popular features of Lower Cathedral Valley. Hartnet Draw is the next major physiographic feature to the south, and it includes Ackland Spring.

South of Hartnet Draw is a large region called South Desert, at the base of the Waterpocket Fold. Major features of South Desert include Temple and Jailhouse Rocks. South Desert Spring, Ring Water Spring, and Bull Spring provide meager water sources in the region. Polk and Deep Creeks, both intermittent, converge near Temple Rock, and Deep Creek ends in the Fremont River to the south.

The defining physiographic feature of the park is the Waterpocket Fold, a nearly 100-mile-long monocline, or up-thrust, of which about 75 miles is preserved within the park boundary. This spectacular feature stretches from the western park boundary just south of Thousand Lake Mountain to the southern tip in lower Halls Creek. Capitol Reef is the name of the portion of the fold near the Fremont River. Within the fold are many slot canyons that are popular with hikers. These canyons include Burro Wash, Cottonwood Wash, and Sheets Gulch. These narrow, sinuous canyons were formed by rushing water, are deeper than they are wide, and often hold pools of water that must be waded or swam in order to pass.

Paradise Flats is located in the western part of the Waterpocket Fold within the park. The upper region of the intermittent Deep Creek runs just north of the flats. Deep Creek is fed by Deep and Upper Deep Creek Springs. Paradise Draw runs through the middle of Paradise Flats, and Water Canyon runs mainly west to east along its southern edge.

Further south, Spring Canyon with its intermittent wash enters the west edge of the park and runs northwest to southeast into the Fremont River. South of Spring Canyon are Meeks Mesa and some of the more popular physiographic features of Capitol Reef, such as Chimney Rock, Mummy Cliff, the Castle, Hickman Bridge, and Capitol Dome.

The Fremont River Gorge contains the perennial Fremont River and its associated terraces and flood plains. Sulphur Creek (also perennial) and the Fremont River converge near Fruita. The Fremont River exits out the eastern edge of the park.

The Scenic Drive corridor runs south from the Fremont River to Pleasant Creek and provides access to many physiographic features. To the west of Scenic Drive are the flanks of Miners Mountain, which are bisected by many canyons and washes, including Wide Hollow, Cuts Canyon, Capitol Wash, and Grand Wash. On the east side of Scenic Drive are many other prominent features, such as Golden Throne, Cassidy Arch, and Ferns Nipple.

South Draw continues south where Scenic Drive ends and exits the park near Tantalus Flats in Dixie National Forest.

South of the point where South Draw exits the park, Sheets Gulch and Oak Creek enter the park from the west, cut through the Waterpocket Fold, and exit the east park boundary. North and South Coleman Canyons originate on Dry Bench, which straddles the boundaries between the park and Dixie National Forest, and cut east through the Waterpocket Fold. These canyons also exit the park at its east boundary. The Circle Cliffs enter the park below Dry Bench and form the scarp slope of the Waterpocket Fold until they exit the park at its northernmost join-point with Glen Canyon National Recreation Area. West of the Circle Cliffs, moving from north to south within the park, are the following prominent places and features: the Flats, Onion Flats, Burr Trail, and Wagon Box Mesa.

On the east side of the park, Notom Road enters the park to the east of Cedar Mesa through a spot called the Narrows. The intermittent stream named Sandy Creek flows north through the Narrows. Sandy Creek flows through Divide Canyon, which originates on Tarantula Mesa just outside the eastern boundary of the park. Bitter Creek Divide is south of the campground and is the point where drainages begin to flow generally to the south. This divide is the northernmost point of the Halls Creek drainage, which continues south from this point, exits the southern boundary of the park, and flows into Lake Powell.

The western edges of Tarantula and Swap Mesas roughly form the eastern boundary of the park from Cedar Mesa to where Burr Trail exits the park near the Post to the south. Some major drainageways that flow from these mesas westward into the park include Divide Canyon, Bitter Creek, Bitter Spring Creek, and Swap Canyon. Further south, Big Thompson Mesa and Hall Mesa continue just outside the eastern boundary of the park.

The area between the Waterpocket Fold and Tarantula and Swap Mesas is called Strike Valley, or alternatively Grand Gulch. It continues south to the Halls Creek Narrows. Halls Creek travels south the entire length of Strike Valley and is fed by the various drainages off the mesas to the east and by the watershed of the Waterpocket Fold to the west, including Headquarters, Surprise, Burr, Lower Muley, and Upper Muley Canyons. Features in Strike Valley include the Oystershell Reef.

The Waterpocket Fold south of Cedar Mesa includes many physiographic features, such as Red Canyon, Peekaboo Arch, Saddle Arch, Upper and Lower Muley Twist Canyons, Hamburger Rocks, Brimhall Arch, Red Slide, and many natural water-holding pockets, such as Muley, Willow, Cottonwood, and Fountain Tanks.

At the southernmost point of the park is the Halls Creek Narrows, a deep and twisting slot canyon through which flows Halls Creek, which is perennial at this point.

Climate

The variations in elevation and the rugged topography of Capitol Reef National Park produce considerable variations in temperature and precipitation. The topography can be divided into three groups of landforms: (1) the low valleys, represented by the South Desert and Halls Creek areas; (2) the intermediate benches, valleys, and canyons, typified by the Waterpocket Fold; and (3) the upland mountain slopes on the flanks of Thousand Lake and Miners Mountains. Tables 1, 2, and 3 show data from the weather station at Capitol Reef National Park headquarters, at an elevation of 5,500 feet (1,667 meters). These data are typical of the intermediate elevations (mesic soil temperature regime and ustic aridic soil moisture regime). Data from the station at Hanksville, at an elevation of 4,310 feet (1,306 meters), are typical of the low valleys (mesic soil temperature regime and typic aridic soil moisture regime). Data from the Emery weather station, at an elevation of 6,250 feet (1,894 meters), represent the higher elevations in the northern part of the park (frigid soil temperature regime and aridic ustic soil moisture regime). Data from the Boulder weather station, at an elevation of 6,700 feet (2,030 meters), represent the higher elevations in the central and southern parts of the park (mesic soil temperature regime and aridic ustic soil temperature regime). Locations of the weather stations near the park are indicated in figure 1.

Local topography also affects temperatures and the amount of moisture available for plant growth. In Fruita, the protective walls of the Fremont River canyon and large masses of rock can store and radiate heat and thus produce a growing season that is longer than those in surrounding areas. Variations in slope shape can create water-gathering depressions, allowing the growth of more lush and diverse vegetation than expected. Cold air can collect in valleys, while adjacent slopes at higher elevations are warmer. Aspect effects also allow for the more lush growth of vegetation on north-facing slopes as compared to the adjacent south-facing slopes.

The majority of precipitation falls as rain during the growing season. This rain is produced by thunderstorms as moist air from the Gulf of Mexico moves across the survey area from the south or southeast or as Pacific moisture is entrained in air flowing from the southwest. The precipitation in the winter months is usually deposited by frontal storms moving from the west. On average, August is the wettest month recorded at all of the weather stations. The driest month on average is December at the Capitol Reef weather station, June at the Hanksville and Boulder weather stations, and November at the Emery weather station. Precipitation can vary greatly from

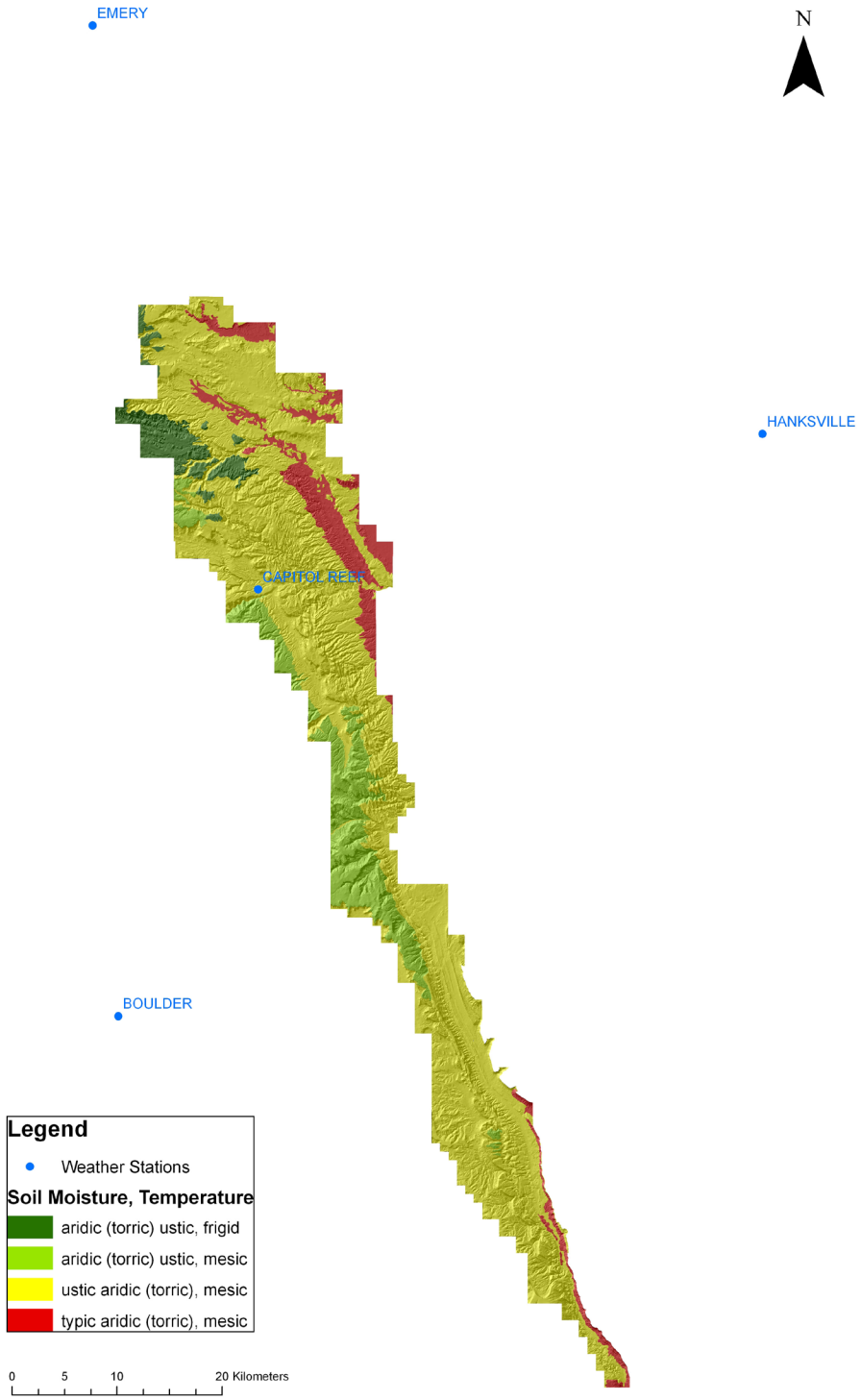

Figure 1.—Locations of weather stations in and near Capitol Reef National Park, Utah.

year to year, with the standard deviation roughly equal to the average precipitation for a particular month. The warmest month is July and the coldest month is January according to records at all four weather stations.

Table 1 gives data on temperature and precipitation for the survey area as recorded at the Capitol Reef National Park headquarters in the period from 1971 to 2010.

Table 2 shows probable dates of the last freeze in spring and the first freeze in fall. Table 3 provides data on length of the growing season. Growing degree days are also 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 (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings between the last freeze in spring and the first freeze in fall.

Figures 2, 3, 4, and 5 show data from the park headquarters, Hanksville, Boulder, and Emery weather stations, respectively.

Average windspeed, estimated from the nearby Hanksville weather station, is about 3.7 miles per hour. Prevailing wind direction, estimated from the Circleville SCAN site, is generally from the south to southwest. Average windspeed is highest, 8.7 to 9.2 miles per hour, in April, May, and June. Thunderstorm days, relative humidity, and percent sunshine were estimated from the First Order station at Grand Junction, Colorado. The average relative humidity in midafternoon is about 36 percent. Humidity is higher at night, and the average at dawn is about 60 percent. The sun shines 79 percent of the time possible in summer and 62 percent in winter.

Capitol Reef National Park headquarters (period of record 1967 to 2011)

In winter, at Capitol Reef National Park headquarters, the average temperature is 32.3 degrees F and the average daily minimum temperature is 21.8 degrees F. The lowest temperature on record, which occurred on January 7, 1971, is -9 degrees F. In summer, the average temperature is 75.1 degrees F and the average daily maximum temperature is 89.1 degrees F. The highest recorded temperature, which occurred on June 26, 1970, is 104 degrees F.

The average annual precipitation during the period of record is about 7.66 inches. Of this, 4.43 inches, or 58 percent, usually falls in April through September. The growing season for most plants falls within this period. In 2 years out of 10, the rainfall in April through September is less than 1.24 inches. The heaviest 1-day rainfall during the period of record was 1.78 inches, recorded on October 6, 2006. Thunderstorms occur on about 40 days each year, and most occur in July and August.

The average seasonal snowfall is about 15 inches. The greatest snow depth at any one time during the period of record was 24 inches. On the average, 16 days of the year have at least 1 inch of snow on the ground, but the number of such days varies from year to year.

Hanksville (period of record 1910 to 2011)

In winter, at Hanksville, the average temperature is 29.6 degrees F and the average daily minimum temperature is 14.7 degrees F. The lowest temperature on record, which occurred on January 2, 1919, is -35 degrees F. In summer, the average temperature is 76.2 degrees F and the average daily maximum temperature is 95.1 degrees F. The highest recorded temperature, which occurred on July 8, 1989, is 114 degrees F.

The average annual precipitation during the period of record is about 5.67 inches. Of this, 3.16 inches, or 56 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 0.76 inch. The heaviest 1-day rainfall during the period of record was 3.07 inches, recorded on October 6, 2006. Thunderstorms occur on about 40 days each year, and most occur in July and August.

The average seasonal snowfall is about 7 inches. The greatest snow depth at any one time during the period of record was 15 inches. On the average, 25 days of the year have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

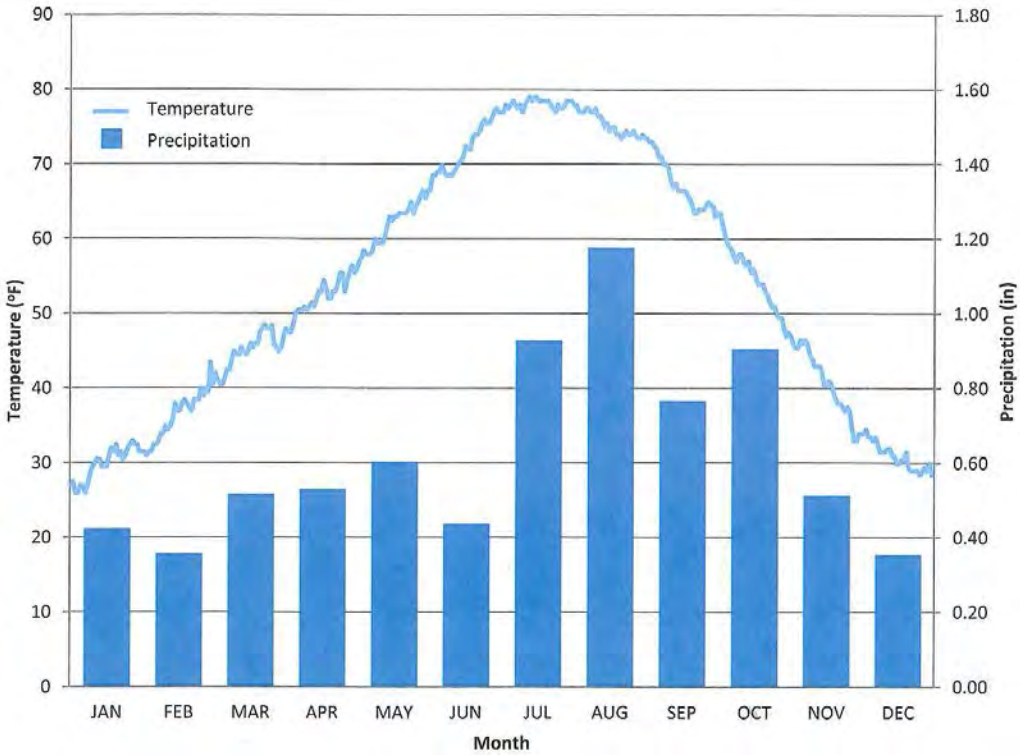

Figure 2.—Daily average temperature and monthly average precipitation at the Capitol Reef National Park headquarters weather station.

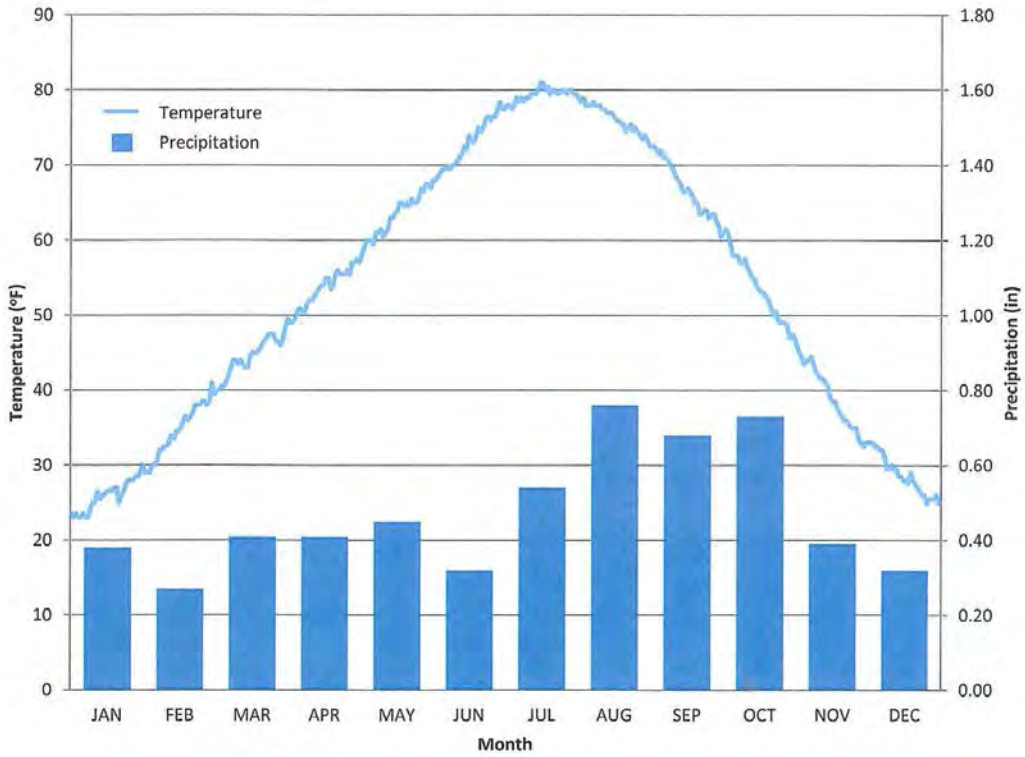

Figure 3.—Daily average temperature and monthly average precipitation at the Hanksville weather station.

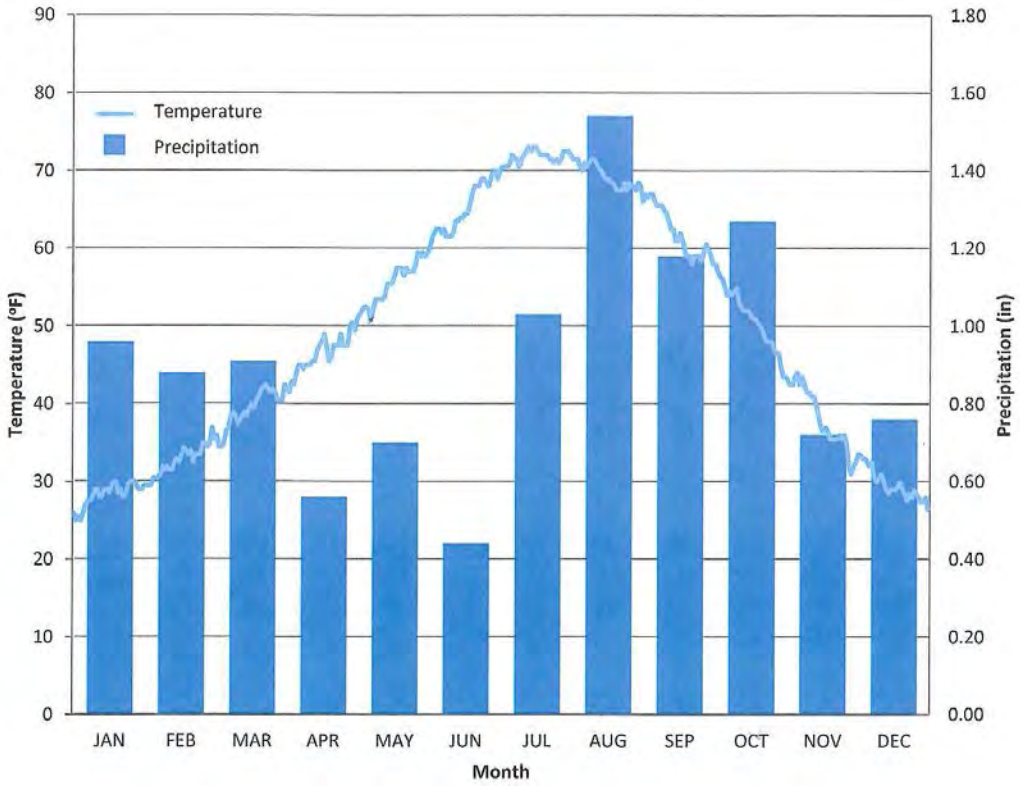

Figure 4.—Daily average temperature and monthly average precipitation at the Boulder weather station.

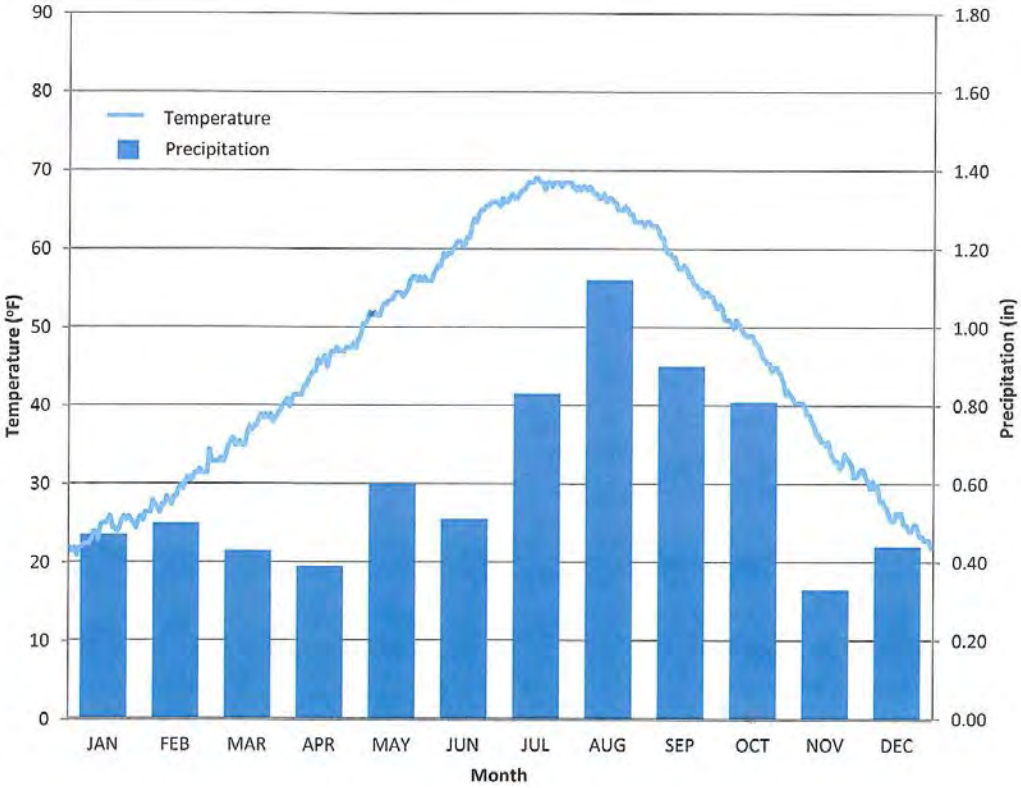

Figure 5.—Daily average temperature and monthly average precipitation at the Emery weather station.

Boulder (period of record 1954 to 2011)

In winter, at Boulder, the average temperature is 30.2 degrees F and the average daily minimum temperature is 19.1 degrees F. The lowest temperature on record, which occurred on February 6, 1989, is -17 degrees F. In summer, the average temperature is 68.7 degrees F and the average daily maximum temperature is 81.9 degrees F. The highest recorded temperature, which occurred on June 23, 1961, is 96 degrees F.

The average annual precipitation during the period of record is about 10.95 inches. Of this, 5.45 inches, or 50 percent, usually falls in April through September. The growing season for most plants falls within this period. In 2 years out of 10, the rainfall in April through September is less than 1.41 inches. The heaviest 1-day rainfall during the period of record was 2.88 inches, recorded on October 6, 2006. Thunderstorms occur on about 40 days each year, and most occur in July and August.

The average seasonal snowfall is about 34 inches. The greatest snow depth at any one time during the period of record was 38 inches. On the average, 84 days of the year have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

Emery (period of record 1901 to 1978)

In winter, at Emery, the average temperature is 26.6 degrees F and the average daily minimum temperature is 13.5 degrees F. The lowest temperature on record, which occurred on February 13, 1905, is -20 degrees F. In summer, the average temperature is 65.1 degrees F and the average daily maximum temperature is 80.8 degrees F. The highest recorded temperature, which occurred on July 26, 1931, is 98 degrees F.

The aveage annual precipitation during the period of record is about 7.33 inches. Of this, 4.35 inches, or 59 percent, usually falls in April through September. The growing season for most plants falls within this period. The heaviest 1-day rainfall during the period of record was 2.60 inches, recorded on May 16, 1928. Thunderstorms occur on about 40 days each year, and most occur in July and August.

The average seasonal snowfall is about 21 inches. The greatest snow depth at any one time during the period of record was 2 inches. On the average, 1 day of the year has at least 1 inch of snow on the ground.

Vegetation

Dominant vegetation patterns can be generalized for regions of the park based on variations in soils, climate, and physiography. This section provides a general description of vegetation throughout the park, starting from the north. Some species, particularly Indian ricegrass and blue grama, are essentially ubiquitous inside the park.

In the Cathedral Valley area at the northern end of the park, alkali sacaton and black greasewood dominate the valley bottoms. Fourwing saltbush, winterfat, and blue grama are also common on the valley floor, and shadscale commonly skirts the foothills. The flank of Thousand Lake Mountain in the northwestern corner of the park is dominated by twoneedle pinyon and Utah juniper, which in some areas have encroached onto deep soils dominated by mountain big sagebrush. The escarpments surrounding the Upper and Lower Cathedral Valleys, Hartnet Draw, and the South Desert support sparse shadscale and mat saltbush. The surrounding hills are mostly scattered with twoneedle pinyon, Utah juniper, and shadscale, though there are also large barren hills with sparse vegetation, mostly Torrey’s jointfir, south of the South Desert.

At higher elevations to the southwest, the Paradise Flats area is characterized by large grassy flats, pinyon-juniper hills, and some ponderosa pine in the narrow canyons. The grassy flats are dominated by needle and thread, blue grama, and

brittle pricklypear. Further south, on Meeks Mesa, twoneedle pinyon and Utah juniper generally dominate but fourwing saltbush and needle and thread dominate some deep sandy areas.

The Fremont River Gorge supports Fremont cottonwood, Baltic rush, coyote willow, and common threesquare near the river channel. Several non-native species, including common reed, tamarisk, and Russian olive, are also common along the riparian corridor. On the high terraces, fourwing saltbush and basin big sagebrush are interspersed with native perennial bunchgrasses, including Indian ricegrass and needle and thread.

The Waterpocket Fold, which extends 75 miles throughout the park, contains shallow soil pockets that support littleleaf mountain mahogany, twoneedle pinyon, Utah juniper, cliffrose, Bigelow sage, and singleleaf ash.

To the west of the Waterpocket Fold, along Scenic Drive, vegetation in the valley bottom alternates between fourwing saltbush and shadscale grasslands. The flank of Miners Mountain to the west is covered by Utah juniper and twoneedle pinyon and has other shrubs but very little grass. To the east, a steep escarpment is sparsely vegetated with crispleaf buckwheat, shadscale, and small Utah junipers. Scenic Drive ends at Pleasant Creek, which supports Baltic rush, coyote willow, Fremont cottonwood, and basin big sagebrush. Similar vegetation grows along Oak Creek to the south. In South Draw, the vegetation in the valley bottom alternates between Wyoming big sagebrush and Utah juniper. Steep hills on both sides of the valley are dominated by Utah juniper and twoneedle pinyon, though vegetation is more sparse to the east and more dense to the west. Utah juniper and twoneedle pinyon remain dominant southward beyond Dry Bench. A small area called Onion Flats, to the south of Dry Bench, once supported Wyoming big sagebrush and perennial bunchgrasses but was seeded several decades ago to Russian wildrye. The seeded species is still dominant today.

Along Notom Road, on the easternmost boundary of the park, are gypsum foothills dominated by Torrey's jointfir and flats dominated by shadscale. These areas extend north from Notom Road, across the Fremont River along the eastern border of the park, to the South Desert area. Notom Road leaves the park for several miles but returns near Cedar Mesa, which is dominated by Utah juniper. Cedar Mesa is flanked by shadscale hills and flats supporting Wyoming big sagebrush and fourwing saltbush grasslands.

South of Cedar Mesa is the long and narrow Strike Valley. Intermittent stream channels bisect the valley bottom, which is dominated by blue grama, Indian ricegrass, and needle and thread interspersed with patches of basin big sagebrush, black greasewood, and fourwing saltbush. To the east, steep escarpments and flats are dominated by mat saltbush and shadscale with very little grass.

Blackbrush is abundant on foothills and flats in the Halls Creek area at the south end of the park. The valley bottom of Halls Creek is dominated by alkali sacaton, sand sagebrush, and black greasewood. Fremont cottonwood is common near the intermittent stream channel. The surrounding escarpments, as well as Red Slide, are dominated by blackbrush and shadscale. Near the Halls Creek Narrows where the stream becomes perennial, coyote willow and Baltic rush grow near the stream channel.

For more specific information on vegetation, refer to the "Ecological Site Description Report for Capitol Reef National Park," (United States Department of Agriculture, Natural Resources Conservation Service, 2013).

Geology

Capitol Reef National Park can be divided into two main geologic provinces: (1) the Waterpocket Fold, which extends north-south along the length of the park, and (2) Cathedral Valley and the South Desert in the northern part of the park. The

Waterpocket Fold, named for the many tanks and potholes that collect water after a rain, is an exposure of a nearly 100-mile-long anticline created by compression resulting from collision and subduction of the Farallon oceanic plate with the North American continental plate. This event, called the Laramide orogeny, created many thrust faults in the brittle Precambrian basement rocks of the area. The more ductile sedimentary layers overlying the basement rocks were folded as faulting occurred, creating the Waterpocket Fold. Erosion subsequently exposed strata within the fold. Younger strata were exposed to the east and older strata to the west. Because of the upwarp created by the faulting, older strata also occur progressively higher in elevation, in an apparent reversal of the order of deposition. These strata encompass a variety of depositional environments, including open ocean, marine tidal flats and sabkhas, fluvial and lacustrine systems, and sandy deserts (fig. 6). Each formation has a characteristic physical and chemical composition that has resulted in the unique monoliths, domes, bridges, slot canyons, valleys, hills, and other landforms found throughout the park (Huffman et al. 1996; Smith et al., 1963).

In the north part of Capitol Reef NP, the Waterpocket Fold bends to the west of the park. This area of the park is dominated by Jurassic-aged sediments that have remained nearly horizontal. Remnants of volcanic activity are evident in dikes and sills that cut the sedimentary strata, and outwash and alluvium of volcanic origin cover much of the strata.

Quaternary Period

Much of Capitol Reef is overlain by Quaternary alluvial deposits (fig. 7). These deposits range in age from Holocene through Pleistocene and Upper Pliocene. Holocene alluvial deposits include stream channels, flood plains, and terraces. They occur extensively in Cathedral Valley and the South Desert and along major drainages. Soils on these landscapes include Radnik (which is stratified and occurs on flood-plain steps), Begay (which is on stream terraces), and Chilton (which is on gravelly alluvial fans).

Older Pleistocene and Upper Pliocene alluvial deposits are basaltic in composition and originated from Boulder Mountain and Thousand Lake Mountain, which are volcanic mountains to the west of the park (fig. 8). The deposits range from well sorted pediment gravel to poorly sorted boulder deposits. In the arid climate of the park, carbonate coats are common on rock fragments. The thickness of the coats may be indicative of the age of the deposits and amount of precipitation. Black basalt clasts coated with white carbonates are visible in many areas along road cuts in Cathedral Valley. In these older alluvial deposits, skeletal soils with well developed calcic horizons (such as Strych, Clapper, and Foy) are common. In areas with fewer rock fragments, soils with calcic horizons but less than 35 percent coarse fragments (such as Abra, Mivida, and Milok) also occur. The basaltic alluvial deposits also occur on strath terraces or bedrock-controlled alluvial terraces, along Highway 24 and the Fremont River canyon east of Fruita (fig. 9).

Holocene eolian deposits consisting of windblown sands also occur in the park (fig. 10). These deposits are common on Navajo Sandstone and Entrada Sandstone but can occur any place that has a stable surface that allows deposits to accumulate, commonly at the base of shrubs in coppice dunes. Nalcase and Arches are examples of shallow soils in eolian sands accumulating over bedrock, while Mido is an example of a very deep eolian soil on dunes or stabilized sand sheets.

Colluvial deposits are the third type of transported parent material common in the park. These gravity-transported materials commonly mantle steep slopes or are on talus slopes at the base of cliffs or escarpments (fig. 11). A common colluvial deposit occurs where the slope-forming Chinle Formation meets the cliff-forming Wingate Sandstone, with Wingate Sandstone colluvium mantling the slope below. Mathis and Catahoula soils are common on these talus slopes.

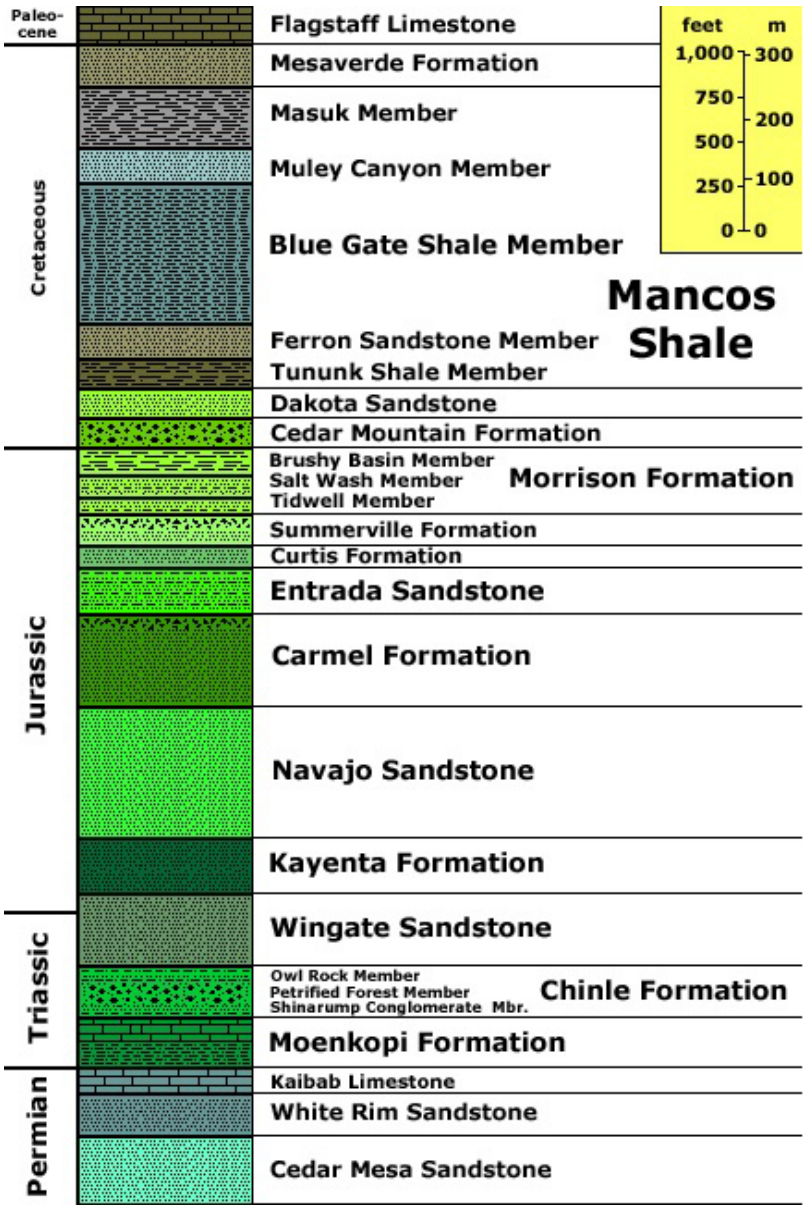

Figure 6.—Stratigraphy in the region of Capitol Reef National Park. Available online at http://parks.wr.usgs.gov/coloradoplateau/capitolreef_strat.htm. Recent research and dating now places the Wingate Sandstone in the Jurassic period.

In addition to the sedimentary strata and transported materials in the park, Neogene (formerly Tertiary) intrusive igneous dikes cut though the bedrock in Cathedral Valley (fig. 12). The basaltic dikes are associated with the volcanic episode that created Boulder Mountain and Thousand Lake Mountain to the west of Capitol Reef and represent the roots of the former volcanic field (Morris et al., 2003). Erosion of the softer Entrada Sandstone surrounding the dikes creates protruding ridges.

Cretaceous Period

During the Cretaceous period (66 to 145 million years ago), subduction of the Farallon oceanic plate beneath the North American continental plate resulted in a regional mountain building event called the Sevier orogeny. Sedimentary strata

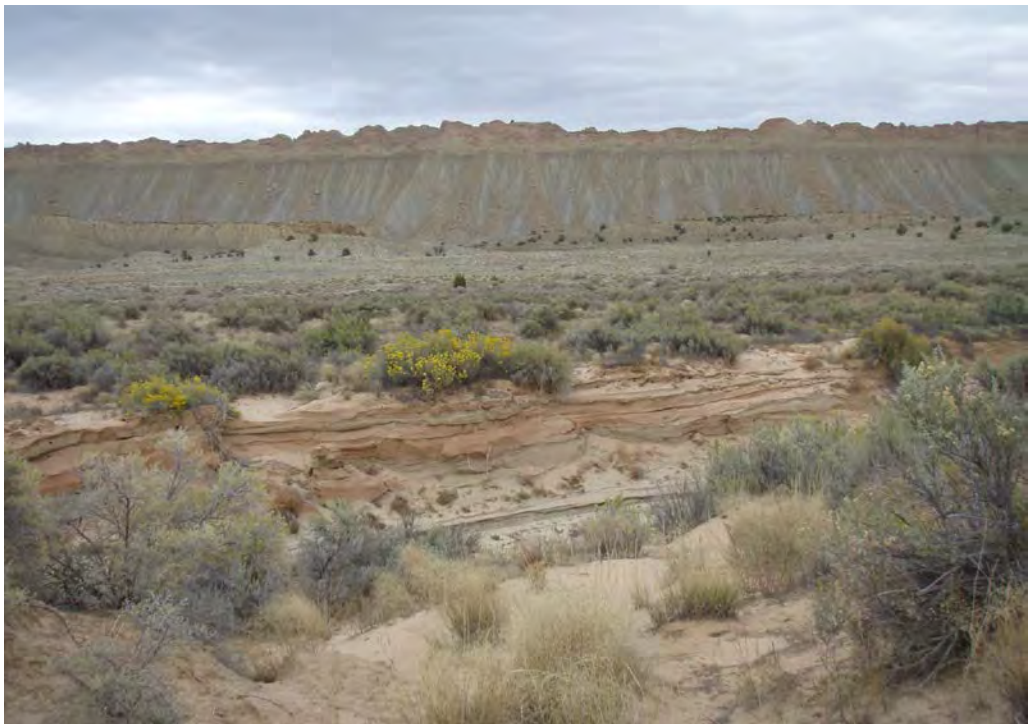

Figure 7.—Quaternary alluvial deposits in Strike Valley show sources of deposition alternating between shale (yellow) and sandstone (pink). The low hogback of the Ferron Sandstone, the escarpment of the Blue Gate shale, and cliffs of the Emery Sandstone are visible in the background.

Figure 8.—Pleistocene and Upper Pleistocene basaltic pediment deposits that blanket Cathedral Valley had origins in Thousand Lake Mountain to the west of Capitol Reef National Park. White carbonate coats are visible on some of the basalt clasts in the foreground.

Figure 9.—Strath terraces consisting of basalt alluvium over sandstone bedrock occur along the Fremont River canyon east of Fruita.

Figure 10.—Holocene eolian deposits consist of well sorted, fine grained sands.

Figure 11.—Quaternary colluvial deposits in the Wingate Sandstone.

Figure 12.—Intrusion of Neogene igneous volcanic dikes in the Entrada Formation in Cathedral Valley. The softer sandstone has weathered around the dikes.

Figure 13.—The Ferron Sandstone Member of the Mancos Shale forms a low hogback in the middle of Strike Valley. The valley to the left of this geologic member is the Tununk Shale Member, and the Cretaceous Dakota Sandstone is visible in the upper left corner of the photo. The gullied valley and slope to the right of the Ferron Sandstone Member is the Blue Gate Shale Member, and cliffs of the Emery Sandstone Member are visible in the upper right corner.

Figure 14.—The Blue Gate Member of the Mancos Shale. In the foreground, to the right, is the hogback of the Ferron Sandstone Member. In the background, at the top of the escarpment, are the cliffs of the Emery Sandstone Member.

overlying the Precambrian basement rocks detached and were pushed eastward, faulted, and folded into a high mountain range by the steeply dipping plate subduction. The isostatic depression of these mountains created an interior seaway extending from Canada to the Gulf of Mexico (Morris et al., 2003). Cretaceous strata in Capitol Reef consist of coastal plain and nearshore sediments interfingered with marine shales (Hintze and Kowallis, 2009).

Mesaverde Formation. Interbedded light brown and gray sandstones and shales represent the migration of barrier beaches and deltas into the interior seaway. The sandstones are thick bedded and cross stratified, and conglomerates may occur near the upper part of the formation (Morris et al., 2003). The Mesaverde Formation formed the cliffs that cap the Mancos Formation shale mainly to the east of the park, but it is exposed within the park near Bitter Creek Divide and is visible along the length of Notom Road.

Mancos Shale. This layer consists mainly of marine shales but also contains several thin sandstone beds that mark the transition between nearshore and open ocean depositional systems. In the vicinity of Capitol Reef NP, the Mancos Shale is divided into five members: the Masuk Member, Emery Sandstone, Blue Gate Shale, Ferron Sandstone, and Tununk Shale. The Mancos Shale makes up the small, gullied valley to the east of the Waterpocket Fold, with small linear hogbacks or ridges composed of the Ferron Sandstone Member and of more resistant sandstone units within the shale members (fig. 13). The cliffs formed by the Emery Sandstone delineate the park boundary along parts of its eastern edge, while shale and mudstones of the Blue Gate Shale Member form the yellowish to bluish gray slopes below the cliffs (fig. 14). Soils that formed on the Mancos Shale tend to have fine-silty, fine-loamy, or clayey textures and may have crystals of gypsum or salt accumulations on the surface and in the profile. An example of a soil on the slope-forming section of the Blue Gate Shale is Eslendo, a shallow colluvial soil overlying shale bedrock. Soils in the gullied valleys common in the Blue Gate and Tununk Shale Members include Querencia and Lybrook, deep soils that have loamy and clayey textures, respectively. The bluish gray Blue Gate Shale and Tununk Shale Members represent deposition in open marine environments and may include fossil bivalves, fish scales, and foraminifera (Morris et al., 2003). The bentonite exposures seen along Notom Road are also composed of these members, as volcanic ash from the Sevier orogeny was deposited in marine environments and altered to smectitic clays. These clays shrink and swell with wet-dry cycles, creating the cracked and weathered surface on the mostly barren bentonite hills. On the hogbacks and cuestas composed of the more resistant Emery Sandstone and Ferron Sandstone Members, which formed in higher-energy fluvial and delta depositional environments, lithic soils with sandy loam textures, such as Rizno, are common.

Dakota Sandstone. Although mostly sandstone, this layer also contains coal, shale, and conglomerate. The different layers within the Dakota Sandstone represent fluctuation in the shoreline of the interior seaway and indicate transitions among terrestrial (coal), high-energy nearshore (sandstone), and marine (shale) environments. The sandstone commonly contains fossil marine bivalves and forms the Oyster Shell Reef along Notom Road near Bitter Creek Divide (fig. 15). Rizno soils are also common on the low ridges and hogbacks formed by the Dakota Sandstone.

Jurassic Period

The Jurassic period (145 to 200 million years ago) consists of predominantly terrestrial deposition. Evidence of the massive ergs, or sandy deserts, which overlay the region during much of the early Jurassic period can be seen in the Wingate Sandstone, Kayenta Formation, and Navajo Sandstone, which make up the Glen Canyon Group and are the thickest and most prominent formations of the Jurassic period in Capitol Reef NP (fig. 16). During the middle Jurassic period, advance and

Figure 15.—Fossil bivalves in the Dakota Sandstone make up the Oyster Shell Reef.

retreat of a shallow seaway produced the interbedded sandstone, limestone, shale, and gypsum of the Carmel, Entrada, Curtis, and Summerville Formations (fig. 17). Late Jurassic sediments of the Morrison Formation were deposited in an interior basin of lakes and streams (Hintze and Kowallis, 2009).

Morrison Formation. In Utah, the Morrison Formation is known for its abundance of dinosaur bones and uranium deposits. Locally, this formation is divided into two members: the Brushy Basin Member and the Salt Wash Member. The Brushy Basin Member, which contains most of Utah's dinosaur fossils, is composed of claystones, mudstones, and siltstones deposited in lacustrine, fluvial, and deltaic systems in a terrestrial basin (Hintze and Kowallis, 2009). These sediments also contain a large percentage of bentonite and smectitic clays, derived from volcanic ash deposited around 150 million years ago. Soils that formed in the Brushy Basin Member include Emco family (a shallow, clayey soil) and Peachsprings (a strongly saline, deep soil with salt accumulations). Many areas mapped on the Brushy Basin Member are considered badlands because no vegetation grows on the highly cracked and weathered surface generated by the expansible clays (fig. 18). The Bentonite Hills along River Ford Road to Cathedral Valley are composed of the Brushy Basin Member. The Salt Wash Member consists predominantly of cross-bedded conglomerate and sandstones deposited in fluvial environments (Morris et al., 2003). Outcrops of the Salt Wash Member are extensive throughout the northeastern portion of the park and commonly form low, rounded domes and bowls paved with a surface of rounded conglomerate pebbles (fig. 19). Soils common on the Salt Wash Member include Moclom (a lithic soil with sandy textures) and Daklos (a lithic soil with sandy loam textures and more than 35 percent rock fragments).

Summerville Formation. This formation is composed of thin-bedded reddish brown siltstones and mudstones with a few alternating beds of greenish gray sandstones (Morris et al., 2003). The Summerville Formation represents tidal flat deposition and

Figure 16.—The Glen Canyon Group. The orangey Wingate Sandstone is in the foreground, the pink Kayenta Formation is in the middleground, and the Navajo Sandstone is in the background.

may contain thin beds of gypsum. The steep, dissected slopes above the Cathedral Valley monoliths are predominantly Summerville Formation (fig. 20) and include soils such as Remorris, which is a shallow soil with loam, silt loam, or clay loam textures weathered from the soft, fractured beds of alternating weakly and strongly consolidated siltstones (fig. 21).

Curtis Formation. The Curtis Formation forms the white caprock above the cathedrals and pinnacles of Cathedral Valley (fig. 22). The light-colored sandstone and

Figure 17.—The Jurassic Entrada (brown, at bottom of photo), Curtis (white, in middle), and Summerville (pinkish gray, at top) Formations in South Desert. Remnants of sandstone cliffs of the Salt Wash Member (Morrison Formation) are visible on top of the Summerville Formation.

Figure 18.—The Brushy Basin Member (Morrison Formation) near the Bentonite Hills. Smectitic clays with a high shrink-swell potential create the cracked, popcorn-like surface in the foreground.

Figure 19.—An outcrop of the Salt Wash Member of the Morrison Formation near Hartnet Draw, showing the characteristic dome and bowl weathering and the rounded pebble clasts in the conglomerate. In the background are the purple and gray hills of the Brushy Basin Member.

Figure 20.—The Cathedral Valley monoliths (in back) consist of the Entrada Sandstone, capped by the white Curtis Formation and the reddish brown Summerville Formation. The valley (in middle) has Holocene alluvial deposits weathered from these sandstones. In foreground, basaltic volcanic pediment deposits from Thousand Lake Mountain (to west) are visible.

Figure 21.—The Summerville Formation, displaying alternating bands of strongly cemented and weakly cemented sandstones. The whitish gray rock in the upper right corner of the photo is the Salt Wash Member of the Morrison Formation.

Figure 22.—The contact between the Curtis Formation (white) and the Entrada Formation (brown).

siltstone, which were deposited in shallow marine environments, provide a resistant layer that protects the softer Entrada Sandstone below from weathering, resulting in the monoliths within the park.

Entrada Formation. The Entrada Formation occurs over a large area of southern Utah. The regionally extensive, thick, red, cross-bedded sandstone forms the arches of Arches National Park and the monoliths of Cathedral Valley. In Capitol Reef NP, the Entrada Formation ranges from 400 to 900 feet thick and represents tidal flat deposition rather than the eolian deposition that occurred in eastern Utah (Morris et al., 2003). Consequently, the Entrada Formation in the park tends to be softer and less consolidated than it is in eastern Utah. The monoliths of Cathedral Valley formed in this softer material consisting of very fine sand to almost silty beds (fig. 23). In the southern portion of the park, the Entrada Formation tends to be more strongly cemented, forming rounded domes and ledges (fig. 24). Soils on the Entrada Formation typically have sandy particle-size classes with few coarse fragments and include Mido (a deep soil on dunes or in areas that trap sediment) and Arches (lithic, eolian sand or alluvial material in shallow bedrock depressions).

Carmel Formation. The colorful and visually striking chevrons or flatirons along the base of the Waterpocket Fold escarpment are composed of the Carmel Formation (fig. 25). Formed during alternating periods of marine deposition and evaporation in sabkhas, or shallow coastal flats, the Carmel Formation consists of interbedded sandstones, mudstones, limestones, siltstones, and gypsum (fig. 26). The sandstones and mudstones of nearshore environments are typically red or brown, the limestones of marine deposition gray, and the evaporate gypsum beds white. Soils with high gypsum contents, such as Lemrac (moderately deep) and Retsabal (shallow), are common on the gypsum beds of the Carmel Formation (fig. 27). Although these soils

Figure 23.—Cathedral Mountain, one of the prominent monoliths of Cathedral Valley, is composed of the Entrada Sandstone capped by white sandstone of the Curtis Formation. Pediments covered with basaltic alluvium from Thousand Lake Mountain are visible in the background, to the left.

Figure 24.—The Entrada Sandstone and eolian deposits associated with it make up the orange ridge (in middle), near the Post. The sandstone is more strongly cemented in the southern part of Capitol Reef National Park than in Cathedral Valley (to north). In back are the Dakota Sandstone (right) and the Blue Gate and Emery Sandstone Members of the Mancos Formation (left).

Figure 25.—The Carmel Formation along the escarpment of the Waterpocket Fold. Pinkish white beds in the foreground are gypsiferous. Interbedded limtestones, sandstones, and shales (gray, red, brown) form the repeating chevrons in the middleground. The white sandstone in the upper right corner of the photo is part of the Navajo Formation, and the brownish orange sandstone in the upper left corner is part of the Entrada Formation.

Figure 26.—The Carmel Formation above South Desert, consisting of interbedded and multicolored sandstone, limestone, shale, and gypsum. The horizontal strata of the Entrada, Curtis, and Summerville Formations are visible in the background. Jailhouse Rock is in the center background.

Figure 27.—Gypsum crystals within the Carmel Formation.

may have a thin cap of eolian material over the white gypsum rock, they are easily distinguished from the soils on other beds within the formation by their well developed cyrptobiotic crusts (fig. 28). In the sandstone and mudstone beds, shallow or lithic calcareous soils, including Reef and Rizno, are common. In some areas where the Carmel Formation is thicker and gypsum content is commonly high, steep and dissected undulating topography formed below the Navajo Sandstone.

Navajo Sandstone. The backbone of the Waterpocket Fold consists of the light-colored Navajo Sandstone. This massive, cross-bedded sandstone represents a period of arid conditions when large areas of sand dunes, or ergs, that consisted of predominantly quartz sand and were more than 1,000 feet thick in places, covered the inland basin. The high-angle, large-scale cross-bedding of the Navajo Sandstone indicates dune sizes similar to that of the present-day Sahara Desert (fig. 29). The Navajo Sandstone is typically massive and may be jointed on large scales, rather than being fractured, and therefore tends to weather into rounded forms, such as the many domes, slot canyons, and cliffs in the park (fig. 30). Since the Navajo Sandstone contains very large bedding units and few fractures, rounded shapes are created as individual sand grains weather from the exterior of the sandstone rather than along fractures or weaknesses in the rock. The Waterpocket Fold derives its name from the many tanks and potholes in the Navajo Sandstone that collect water after rains (fig. 31). Soils on the Navajo Sandstone tend to be sandy and moderately deep or shallower to bedrock, forming in local depressions or on low-angle surfaces where alluvial and eolian material can accumulate. Common soils mapped on the Navajo Sandstone are Santrick and Nalcase (Psamments with siliceous mineralogy). These soils have very low cation-exchange capacities and nutrient contents, reflecting the quartz mineralogy of the parent material.

Kayenta Formation. The Kayenta Formation caps the Wingate Sandstone and is visible along the reef as red ledges, slopes, and low cliffs between the Navajo and Wingate Formations (fig. 32). Compared to the massive cross beds of the Navajo and Wingate Sandstones, the Kayenta Formation is relatively thin bedded and represents a transition to fluvial deposition and reworking of eolian sands (Morris et al., 2003). The Kayenta Formation is resistant to weathering and is largely responsible for the sheer cliffs formed by the Wingate Sandstone, which, when unprotected, weathers into more rounded forms like the Navajo Sandstone or fractures easily. Soils on Kayenta Formation sandstones (such as Nihzoni) are typically lithic with loamy textures,

Wingate Sandstone. The Wingate Sandstone also marks a period of dry conditions when massive eolian deposits accumulated in the inland basin. In Capitol Reef, the red, cross-bedded Wingate Sandstone forms the high cliffs along Scenic Drive and Highway 24 near Fruita and the Circle Cliffs near the western border of the park. The Wingate Sandstone fractures easily, and colluvium with its characteristic reddish orange or salmon color can be seen mantling the grey or purple slopes of the Chinle Formation below (fig. 33). The Wingate Sandstone outcrops commonly contain very little soil, but soils such as Catahoula and Mathis can occur in the talus or colluvial deposits originating from this sandstone.

Triassic Period

The Triassic period (200 to 251 million years ago) marks a transition to predominantly non-marine deposits, in contrast to the mostly marine deposits of shallow seas covering Utah during the Paleozoic Era. Petrified forests and dinosaur tracks and fossils found through much of the Triassic layers indicate a generally warm and wet climate with lush terrestrial vegetation. The two Triassic formations in Capitol Reef—the Chinle Formation and the Moenkopi Formation—are separated by an unconformity representing about 6 million years, or all of the Middle Triassic period, during which erosion occurred (Morris et al., 2003; Stokes, 1986).

Figure 28.—The well developed cryptobiotic crust which occurs on soils that formed in gypsum-rich layers within the Carmel Formation.

Figure 29.—An outcrop of the Navajo Sandstone in Pleasant Creek Canyon, showing distinctive large-scale cross-bedding.

Figure 30.—The massive domes of the Navajo Sandstone, bisected by the slot canyon of Burro Wash.

Figure 31.—Large tanks in the Navajo Sandstone. The soil scientist is 5 feet 4 inches in height.

Figure 32.—The sheer cliffs of the Wingate Sandstone are topped by the ledgy, red- and white-striped Kayenta Formation. In the center of the photo, the pinkish upper slopes of the Owl Rock Member of the Chinle Formation are visible below the Wingate Cliffs.

Figure 33.—The Chinle Formation along Scenic Drive. The gray-green slopes (at bottom) are part of the Monitor Butte Member, the brown-orange slopes and cliffs above are part of the Petrified Forest Member, and the pink-purple slopes just below the Wingate Cliffs are part of the Owl Rock Member. A small outcrop of the whitish Shinarump Member is seen at left (middle).

Chinle Formation. The Chinle Formation consists of several members of disparate compositions: the Owl Rock Member, the Petrified Forest Member, the Monitor Butte Member, and the Shinarump Conglomerate (fig. 34). The Owl Rock Member, the uppermost member, lies directly beneath the Wingate Cliffs and consists of orange and purple siltstones, mudstones, and sandstones interbedded with mottled pink and green limestones (Morris et al., 2003). The Owl Rock Member of the Chinle Formation is thought to be lacustrine in origin (Dubiel, 1987). Below the Owl Rock Member is the Petrified Forest Member, which is composed of reddish orange siltstones and clayey sandstones of bentonitic origin and which formed in a fluvial depositional environment (Morris et al., 2003). The gullied slopes of the Petrified Forest Member are prominent on the escarpment below Meeks Mesa and in several large canyons dissecting the Waterpocket Fold, Oak Creek Canyon, Coleman Canyon, and Red Canyon. As its name suggests, petrified wood, where the cell structure has been replaced by silica, is common in the Petrified Forest Member (fig. 35). Soils common in the upper members of the Chinle Formation include Plumasano (a very deep, coarse-loamy soil) and Roced family (a loamy-skeletal soil). Below the Petrified Forest Member is the Monitor Butte Member, which consists of gray and purple bentonitic mudstones that form steep, rounded hills. Quezcan soils, which are shallow or moderately deep and have clayey textures, are common on the Monitor Butte Member. The Shinarump Conglomerate is at the lower edge of the Chinle Formation and consists of whitish or yellowish conglomerates and sandstones. This member is discontinuous throughout Capitol Reef NP but can be seen along Highway 24 near the western boundary of the park, along South Draw Road, and near Onion Flats above Burr Trail. Twin Rocks and the cap of Chimney Rock along Highway 24 are composed of the Shinarump Conglomerate.

Moenkopi Formation. Moenkopi Formation sediments were deposited in stream channels, on playas, and in shallow seas. Thin beds of gypsum or salts indicate periods of evaporation (Hintze and Kowallis, 2009). The Moenkopi Formation in Capitol Reef is composed of four members: the Moody Canyon Member, the Torrey Member, the Sinbad Limestone, and the Black Dragon Member. The Moody Canyon, Torrey, and Black Dragon Members are visually similar in color and appearance and are easily distinguished by stratographic position and mode of weathering. The Moody Canyon Member is located directly below the white Shinarump Conglomerate and contains an upper unit, which forms the reddish brown cliffs of Chimney Rock and Mummy Cliffs, and a lower unit, which forms the slopes below these cliffs (Morris et al., 2003) (fig. 36). The Torrey Member, located beneath the Moody Canyon Member, is a similar reddish brown or chocolate-colored siltstone or fine grained sandstone that forms the series of ledges seen between Torrey and the western part of Capitol Reef NP (fig. 37). Both of these members may contain beds displaying ripple marks characteristic of deposition in tidal flats (fig. 38) and are typically comprised of thin beds alternating in degree of cementation between weakly and strongly consolidated. Soils common on the Moody Canyon and Torrey Members include Simel (a shallow soil with silty, loamy, or clay loam textures weathered in soft, fractured bedrock). The Sinbad Limestone is distinguished from the other Moenkopi members by its yellow color and occurs on the slopes of Miners Mountain and along Burr Trail on the western boundary of the park. The Sinbad Limestone consists of thin beds of dolostone, muddy limestone, sandstone, and siltstone and represents deposition in a shallow sea (Morris et al., 2003). Parts of the Sinbad Limestone may display oolitic layers, beds containing small carbonate spheres precipitated around a seed grain in shallow marine and intertidal environments (fig. 39). Although fractured, the Sinbad Limestone is typically more resistant to weathering than the upper Moenkopi members and forms small plateaus and canyons rather than slopes and ledges. Daklos and Reef soils (lithic, loamy-skeletal soils) are common on the Sinbad Limestone. The Black Dragon Member, at the base of the Moenkopi Formation, also consists of reddish

Figure 34.—The reddish brown slopes in the foreground are part of the Moody Canyon Member of the Moenkopi Formation, capped by the whitish Shinarump Member of the Chinle Formation. In the background, the gray and purple slopes of the Monitor Butte Member, the brownish slopes and ledges of the Petrified Forest Member, and the pinkish slopes of the Owl Rock Member (all members of the Chinle Formation) are visible below the cliffs of the Wingate Sandstone. Colluvium from the Wingate Sandstone mantles the upper slopes of the Owl Rock Member.

Figure 35.—A petrified log in the Petrified Forest Member of the Chinle Formation. The auger is 6 feet in length.

Figure 36.—The Moody Canyon Member of the Moenkopi Formation, showing the upper cliff-forming unit and the lower slope-forming unit. The contact between the Shinarump Conglomerate (white) and the Moody Canyon Member (chocolate brown) is visible at the top of the photo.

Figure 37.—Ledgy slopes and canyons weathered from the Torrey Member of the Moenkopi Formation.

Figure 38.—Ripple marks in the Moenkopi Formation indicate deposition in tidal flats.

Figure 39.—Oolitic clasts in the Sinbad Limestone Member of the Moenkopi Formation.

brown, slope-forming siltstones and sandstones with ripple marks indicating tidal flat deposition (fig. 40). Simel soils also occur on the Black Dragon Member.

Permian Period

During the Permian period (251 to 299 million years ago), a warm, dry climate is thought to have prevailed over present-day southeastern Utah, creating a landscape of dune fields and alluvial fans inundated by periodic marine flooding (Stokes, 1986). Cycles of flooding by shallow seas during the Permian period are likely related to global sea level changes caused by ice advances and retreats (Hintze and Kowallis, 2009). Permian-aged rocks are the oldest exposed rocks within Capitol Reef National Park and are only visible in the deeper canyons along the western margin of the park. An unconformity representing about 15 million years exists between the Upper Permian and Triassic boundary (Hintze and Kowallis, 2009).

Kaibab Limestone. The Kaibab Limestone represents a period of marine intrusion into southeastern Utah, resulting in sediment deposition in shallow seas. Layers of oolitic dolostone, sandstone, and limestone indicate fluctuation of the marine margin (Morris et al., 2003). The Kaibab Limestone is exposed in the gorges of Pleasant and Sulfur Creeks and the Fremont River along the western margin of Capitol Reef NP (fig. 41). Some of the deeper canyons on the slopes of Miners Mountain and near Burr Trail also have exposures of Kaibab Limestone. This limestone tends to form steep, ledgy cliffs that contain soils such as Daklos and Rizno (lithic soils with loamy-skeletal and loamy textures, respectively) in areas where soil materials can accumulate.

Figure 40.—The Fremont River Gorge, displaying steep cliffs carved from the Kaibab Limestone. The Cutler Group sandstones are exposed at the very bottom of the gorge. In the foreground and the upper right corner of the photo, reddish yellow slopes and cliffs of the Black Dragon Member of the Moenkopi Formation are visible.

Figure 41.—The Kaibab Limestone in Pleasant Creek Gorge.

Cutler Group. In Capitol Reef NP, the Cutler Formation is composed of two similar sandstone members: the White Rim Sandstone and the Cedar Mesa Sandstone. In areas outside the park, these sandstones are distinguished by a dividing layer of the Organ Rock Shale. Because this third member does not occur in the park, the sandstone members are together referred to as the Cutler Group (Morris et al., 2003) (fig. 42). Most of the Cutler Group consists of light yellow to grayish, cross-bedded sandstone with well rounded grains, indicating eolian deposition. Some parts, however, contain ripples and marine fossils, indicating deposition in shallow marine environments (Morris et al., 2003). A complex of coastal dunes inundated by periodic marine flooding is likely the formation environment for the Cutler Group (Kamola and Chan, 1988; Cole et al., 1996). In Capitol Reef NP, the Cutler Group is visible as steep,

Figure 42.—Canyons formed in the Kaibab Limestone (cliffs) and the Cutler Group sandstones (in foreground).

rugged cliffs in the Fremont and Sulfur Creek Gorges near the park's headquarters. Soils on the Cutler Group include Daklos and Rizno.

Overview of Soils

All soil development depends on the interaction of five soil-forming factors: parent material, climate, biota (living organisms and their residues), topography, and time. In Capitol Reef National Park, the variety of soils that occur across the landscape can be explained by differences in these five factors. One factor of particular importance in the park is the influence of parent material, or the deposits from which the soils originated. In soils that have relatively little pedogenic development, parent material contributes even more to the soils that result (Miller and Donahue, 1990).

Another important factor in the park is time. The longer the material has remained stable in place, the more weathering of the material occurs, resulting in increased pedogenesis, or soil development. The rate of weathering depends heavily on available moisture. In environments which receive modest amounts of rain or snow, such as Capitol Reef NP, pedogenesis occurs slowly. The variability in the rate of pedogenesis correlates to the the variability of moisture that is received across the span of the park. Soils in the relatively dry South Desert develop more slowly compared to the soils in the relatively moist Upper Cathedral Valley region. Topography also influences weathering. On steep slopes, more water runs off the soil surface and less moves down through the soil profile, and thus pedogenesis is slowed. Steep soils also tend to be less stable because of the increased likelihood that parent material will be moved downslope by gravitational forces and slope wash. Pedogenesis is interrupted whenever the nascent soil slides down the hill or is blown about in strong winds. The factor of time plays a somewhat sporadic role on unstable landforms (Brady and Weil, 2002).

The soils in Capitol Reef National Park can be divided into four main categories based on parent material: eolian (windblown), alluvial (waterborne), residual (weathered in place), and colluvial (transported by gravity).

Eolian Soils

Soils of eolian origin are a major constituent of the suite of soils in Capitol Reef National Park. These windblown materials (mainly fine sands and silts) are highly variable in origin; some come from many miles away, while others are produced very locally, even from rock outcrops within the park. Samples of eolian material in Canyonlands National Park have been dated to 46,000 years ago, with depositional events continuing up to the present day in varying degrees of intensity (Reynolds et al., 2006). The variability in these sources can be observed in the different colors and textures of eolian deposits present throughout the park.

Eolian soils occur throughout Capitol Reef NP, on any surface that provides adequate stability to the shifting sands and silts for plants to take root. These soils vary in depth from a few inches to many feet.

In areas dominated by shallow soils underlain and sometimes surrounded by hard sandstone, the common ecological site is Shallow Sand Rock Pocket (Utah Juniper/ Two-Needle Pinyon), Semidesert Shallow Sand (Utah Juniper-Pinyon), or Upland Shallow Sand (Pinyon-Utah Juniper). These shallow soils often benefit from increased available water, resulting from “run-in” from surrounding bare rock outcrop. Water also tends to linger in these shallow soils that are perched directly on top of hard bedrock; in deeper soils the water moves more quickly down through the soil profile. The presence of scattered junipers on the shallow, sandy Nalcase soil, even in the semi-arid environment of the Waterpocket Fold near Halls Creek Narrows, is the result of this bedrock-influenced increase in moisture available to the juniper roots. The shallow eolian soils commonly occur near mesa edges or in depressions in sandstone rock outcrop in the park and show little structure or color development. Deeper eolian soils occur in the park as well. Some of these deeper soils exhibit greater soil development, or pedogenesis, than the shallow soils. For example, the Begay soils in map unit 7 are primarily of eolian origin and have a zone of structure and color development, called a cambic horizon. Ecological sites associated with deep eolian soils in the park include Semidesert Sand (Fourwing Saltbush) and Upland Sand (Utah Juniper-Pinyon).

Alluvial Soils

Another category of soil within the park is alluvial, or water-borne, in nature. The character of alluvial soils depends strongly upon two factors: the source material of the alluvium and the soil’s landscape position relative to intermittent or perennial

waterways (topography). The parent material determines the general texture of the soil, such as sandy versus silty or loamy, as well as other factors, such as salt content. There are several alluvial map units within the park, for example, map unit 60 (Notom-Begay, moist-Bowington complex, 1 to 6 percent slopes). Map unit 60 is located along the upper parts of Oak and Pleasant Creeks. The Bowington soil is sandy and has few rocks throughout its profile. It is in the lowest landscape position, occupying the thin flood plain. The rarely flooded Notom soil is on the next step up in the fluvial landscape—the flood-plain step. It is sandy as well but also has a great number of rocks throughout its profile, many of which are very large. The high rock content is a result of the parent material being deposited during high-energy flood events that were able to carry heavier coarse fragments as well as the lighter sand. The Begay soil is in the highest landscape position in the map unit—the stream terrace that no longer floods. This soil is loamy rather than sandy and is almost free of rocks, indicating that material from a different source was transported and deposited during yet another flood event. The Begay soil is in a position of greater stability than the other two soils lower on the landscape as they are still subjected to flooding. As a result, the Begay soil shows some pedogenic development, exhibiting the soil structure and color change associated with a cambic horizon. The less stable Bowington and Notom soils exhibit a greater degree of texture and color stratification and little pedogenic development. Ecological sites associated with alluvial soils in the park include Colorado Plateau Riparian Complex Perennial (Valley Type VIII – B4c Stream Type) and Loamy Bottom (Basin Big Sagebrush).

Residual Soils

Residual soils occur throughout Capitol Reef NP. They are considered to have weathered in place and thus have much the same general chemistry as the original parent material. The Reef soil in map unit 75 is primarily residual and developed in place from Moenkopi Formation sandstone and siltstone. The soil reflects the influence of the fine grained sandstone and siltstone in which it developed by its brown colors and loamy textures. Similarly, the Retsabal soil in map unit 80 has a high gypsum content as it weathered directly from the gypsum-rich Carmel Formation. Ecological sites commonly associated with the residual soils within the park include Desert Clay (Castle Valley Saltbush), Semidesert Shallow Loam (Utah Juniper-Pinyon), and Semidesert Shallow Gypsum (Mormontea).

Colluvial Soils

Colluvium occurs on steep canyon sides and escarpments in the park. Colluvial soils result from the falling and tumbling of materials down the steep landscapes. An example of colluvial soils within the park is map unit 87 (Rock outcrop-Myton-Somorent complex, 35 to 60 percent slopes). The colluvial Myton soil reflects the characteristics of the parent material; it contains many rocks, ranging from gravel to boulders, throughout the profile and on the surface. The texture of the soil depends largely upon the geological origin of the colluvial material. Sandstone, such as the Wingate Sandstone or the Kayenta Formation, typically develops into a soil dominated by sand or sandy loam textures. Soils that developed from shale or siltstone, such as that in the Mancos or Chinle Formation, have heavier textures, such as clay loam and silty clay loam. The textures reflect the differences in the geologic sources. Some ecological sites associated with colluvial soils within the park are Desert Very Steep Stony Loam (Shadscale), Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon), and Upland Very Steep Shallow Loam (Pinyon-Utah Juniper).

More information on soil formation is available in the section “Formation and Classification of the Soils.”

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 and shape of the slopes; the general pattern of drainage; the kinds of 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. The approximate percentages of different soils or miscellaneous areas in the different map units was determined using the soil-landscape-landform models developed by extensive ground investigations coupled with remote-sensing tools such as digital elevation models, detailed geology maps, aerial photography, and topographic maps.

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.

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. Map unit composition (estimates of component percentages) was determined using a combination of transects on the ground, as well as photo interpretation based on ground-truthed data points.

Joins with Surrounding Surveys

Capitol Reef National Park is bordered by seven other soil survey areas: Emery County (to the north), the Henry Mountains (to the east), Glen Canyon National Recreation Area (to the south), and Grand Staircase-Escalante National Monument, Dixie National Forest, Fishlake National Forest, and Loa-Marysvale (to the west). The surveys of Dixie and Fishlake National Forests and the Henry Mountains were not joined because of differences in the age of the surveys and the intensity of mapping. The Loa-Marysvale survey was mapped concurrent with that of Capitol Reef, and the two have perfect joins. Documentation in this report for the area along the border with the Loa-Marysvale survey is shared, and the Capitol Reef map units will be used for the Loa-Marysvale survey.

Along the shared border with the Glen Canyon National Monument, map units from the Glen Canyon survey were extended into Capitol Reef to the extent indicated by landforms, documentation, and photo interpretations since these areas are remote and difficult to access. In most areas, joins were achieved with the Glen Canyon survey, but, in a few areas, the information for Glen Canyon was revised to better reflect the extent of soils on known landforms. The map units used within Capitol Reef are copies of the Glen Canyon map units but do not contain the same component composition and data elements. Glen Canyon map unit 28 will be updated to match the edge of the mesa/escarpment near the border with Captiol Reef. In some areas of Glen Canyon map unit 26, Capitol Reef map unit 88 will be brought into the Glen Canyon survey area to more closely match the natural landscape boundaries created by Navajo Sandstone rock outcrops and cliffs.

Along the border with the Grand Staircase-Escalante National Monument (GSENM), joins were achieved with some, but not all, of the map units. No joins were achieved with map units 5073, 5087, 5100, 5109, 5110, and 5112. Capitol Reef map unit 27 is better documented in the area of GSENM 5073, and Capitol Reef map unit 62 is better documented in the area of GSENM 5087. Capitol Reef map unit 17 describes the same landform and position as GSENM map unit 5100 and is better fit to landforms with the newer imagery that was available for the mapping of Capitol Reef. Capitol Reef map units 70 and 23 were used for soils on the Moenkopi and Cutler Formations, respectively, in place of GSENM map unit 5109, which is mapped on the Chinle Formation. Capitol Reef map units 75 and 70 were used for soils that formed on gently sloping and steep areas of the Moenkopi Formation, respectively, in place of GSENM map unit 5110, which is mapped on the Chinle Formation. Capitol Reef map unit 2 is better documented within the Capitol Reef NP survey in the area of GSENM map unit 5112. GSENM map unit 5101 was joined in some areas and brought into Capitol Reef for the lower slopes of escarpments on the Chinle Formation. Capitol Reef map unit 17 will replace this map unit on the steep upper sections of the escarpments along the Circle Cliffs. GSENM map units 5102 and 5103 were joined and used within Capitol

Reef to the logical extent of the landforms and geologies represented. GSENM map unit 5105 is mapped on the Chinle Formation and was used in Capitol Reef for soils on the same geology. In areas of the Moenkopi Formation, Capitol Reef map unit 70 was used and was not joined with GSENM map unit 5105. GSENM map unit 5106 was used in Capitol Reef for the escarpment around Wagon Box Mesa, but the Hillburn series is inactive and was replaced by the closest competitor, the Skos series. Edits to the GSENM survey will be made in an update project.

Previous mapping of Capitol Reef included a quarter-mile buffer around the park that is outside the current park boundary. Along the boundary with the Emery County survey, this buffer will be added to the Emery survey when it is updated, and the Capitol Reef map units contained within the buffer will be added to the Emery legend. Four map units from the Emery survey were used in Capitol Reef—map units 29, 44, 50, and 55. These map units were brought into Capitol Reef to the reasonable extent of the landforms and geology and are copies of the Emery map units. Surface cover data was not collected for these map units in the Emery survey and is not included in the Capitol Reef map units. The Emery map units did not include a range in characteristics for each component; the taxonomic unit description for each series was edited to include observations from within Capitol Reef to produce a range in characteristics for each component in the copied map units. Some missing site data for the modal pedons in the Emery map units, including slope, aspect, and elevation, were estimated from the digital elevation model.

Value Added

This section discusses how this report has added value to the previous soil survey. Imagery used in the original soil survey was pre-1986 black-and-white photographs. Imagery used in this survey consists of color photographs taken in 2009 and has higher resolution than the older imagery. Digital elevation models, which were not available for the original survey, were available at a 10-meter resolution for the current survey. The improved imagery has facilitated tighter line work of map unit delineations. It enabled scientists to follow differences in landforms and geologic parent material more closely, identifying soil surface color changes and distinguishing changes in composition and density of plant communities. Increased confidence levels of map unit composition have been achieved through increasing the number of sample points. The original soil survey had approximately 200 sample points, whereas the current soil survey has nearly 2300 sample points. In addition, key sample points (modal pedons) in map units have had lab analyses for gypsum, calcium carbonate, electrical conductivity, and particle-size distribution. Taxonomic classification of soil series has been updated to the 11th edition of “Keys to Soil Taxonomy.” Five new soil series were created with type locations in Capitol Reef National Park to more accurately represent the soil-forming factors in the park. Range management specialists have collected vegetation data and reviewed and updated ecological site descriptions. Riparian sites have been delineated, and riparian ecological sites have been created. Soil climate zones within the park were refined by analyzing nearby weather station data and vegetation communities.

Detailed soil mapping (Order 2) in the Fruita Historic District resulted in three consociation map units and three new soil series. Minor components and features that are important for management concerns in the orchards were identified in the Fruita Historic District. Soil and leaf nutrient analyses were performed in the Fruita orchards to provide baseline data. Since the Fruita orchards are not managed for commercial purposes but rather for a historical perspective, ranges for crop yields specific to the Fruita orchards were created from the financial records of fruit sales. See the report “Analytical Nutrient Results for Soils of Fruita Orchards” accompanying this soil survey for more information.

General Soil Map Units

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

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

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

Alluvial Soils on Flood Plains, Terraces, and Alluvial Flats

1—Monue-Fruitland association, nearly level to strongly sloping, arid

Map Unit Setting

Landform position: Flood plains and alluvial plains
Elevation: 3,900 to 6,320 feet (1,182 to 1,915 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Slope: 1 to 15 percent

Map Unit Composition

Extent of the map unit in the survey area: 3 percent
Extent of components in the map unit:
Monue and similar soils—55 percent
Fruitland and similar soils—10 percent
Minor components—35 percent

Minor Components

- Sheppard soils on stream terraces
- Myton soils on stream terraces
- Uzona soils on stream terraces

Descriptions

Monue soils
Landform position: Stream terraces
Parent material: Alluvial deposits derived from sandstone

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sandy loam

Fruitland soils
Landform position: Stream terraces
Parent material: Alluvial deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Channery fine sandy loam

2—Begay-Querencia-Sandyranch association, nearly level to strongly sloping, semiarid

Map Unit Setting

Landform position: Flood-plain steps and terraces
Elevation: 3,900 to 6,820 feet (1,182 to 2,067 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 1 to 15 percent

Map Unit Composition

Extent of the map unit in the survey area: 4 percent
Extent of components in the map unit:
Begay and similar soils—41 percent
Querencia and similar soils—10 percent
Sandyranch and similar soils—9 percent
Minor components—40 percent

Minor Components

- Riverwash areas with no vegetation
- Elias soils on stream terraces
- Radnik soils on flood-plain steps and stream terraces
- Mido and similar soils on eolian deposits on stream terraces

Descriptions

Begay soils
Landform position: Stream terraces
Parent material: Alluvial deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sandy loam

Querencia soils
Landform position: Alluvial fans
Parent material: Alluvial deposits derived from sandstone and shale
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sandy loam

Sandyranch soils
Landform position: Flood-plain steps
Parent material: Alluvial and eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Surface layer texture: Fine sand

Colluvial and Residual Soils on Talus Slopes, Ledges, and Escarpments

3—Rock outcrop-Myton-Somorent association, steep to very steep, arid

Map Unit Setting

Landform position: Escarpments, talus slopes, and structural benches
Elevation: 3,940 to 6,000 feet (1,195 to 1,818 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Slope: 20 to 70 percent

Map Unit Composition

Extent of the map unit in the survey area: 1 percent
Extent of components in the map unit:
Rock outcrop—43 percent
Myton and similar soils—21 percent
Somorent and similar soils—21 percent
Minor components—15 percent

Minor Components

- Chipeta soils on escarpments
- Stent family soils on escarpments

Descriptions

Rock outcrop
Landform position: Escarpments, structural benches, and talus slopes
Parent material: Entrada Sandstone and Salt Wash Member (Morrison Formation) sandstone and conglomerate

Myton soils
Landform position: Escarpments
Parent material: Colluvial deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Very gravelly fine sandy loam

Somorent soils
Landform position: Escarpments
Parent material: Slope alluvium and residual deposits derived from shale
Depth class: Shallow to moderately deep
Drainage class: Well drained
Permeability: Moderately slow
Surface layer texture: Silt loam

4—Rock outcrop-Remorris, strongly alkaline-Catahoula association, steep to very steep, semiarid

Map Unit Setting

Landform position: Escarpments and talus slopes
Elevation: 4,260 to 7,830 feet (1,291 to 2,373 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 30 to 75 percent

Map Unit Composition

Extent of the map unit in the survey area: 11 percent
Extent of components in the map unit:
Rock outcrop—29 percent
Remorris, strongly alkaline and similar soils—28 percent
Catahoula and similar soils—18 percent
Minor components—25 percent

Minor Components

- Eslendo soils on hills and escarpments
- Reef soils on structural benches
- Saemo soils on landslides
- Peachsprings soils on alluvial fans

Descriptions

Rock outcrop
Landform position: Escarpments, structural benches, talus slopes, and cliffs
Parent material: Kayenta Formation sandstone, Wingate Sandstone, Shinarump Member (Chinle Formation) sandstone and conglomerate, and Moenkopi Formation sandstone and siltstone

Remorris, strongly alkaline soils
Landform position: Escarpments
Parent material: Residuum weathered from sandstone and siltstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sandy loam

Catahoula soils
Landform position: Talus slopes and escarpments
Parent material: Slope alluvium and residual deposits derived from shale
Depth class: Moderately deep to very deep
Drainage class: Somewhat excessively drained
Permeability: Moderate
Surface layer texture: Gravelly fine sandy loam

5—Rosced family-Quezcan, sodic complex, moderately steep to very steep, dry subhumid

Map Unit Setting

Landform position: Canyons, talus slopes, and hills
Elevation: 4,310 to 7,810 feet (1,742 to 2,314 meters)

Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Slope: 15 to 75 percent

Map Unit Composition

Extent of the map unit in the survey area: 3 percent
Extent of components in the map unit:
Rosced family and similar soils—60 percent
Quezcan, sodic and similar soils—25 percent
Minor components—15 percent

Minor Components

- Rock outcrop on cliffs and structural benches
- Nizhoni soils on structural benches

Descriptions

Rosced family soils
Landform position: Side slopes of canyons
Parent material: Colluvial deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Sandy loam

Quezcan, sodic soils
Landform position: Side slopes of canyons and hills
Parent material: Residual deposits derived from shale and mudstone
Depth class: Shallow to moderately deep
Drainage class: Well drained
Permeability: Slow
Surface layer texture: Sandy clay loam to clay

Shallow Eolian and Residual Soils on Mesas, Mountain Slopes, Cuestas, Structural Benches, and Hills

6—Moenkopie-Rock outcrop association, nearly level to steep, arid

Map Unit Setting

Landform position: Hills, mesas, and structural benches
Elevation: 3,900 to 4,430 feet (1,183 to 1,343 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Slope: 2 to 35 percent

Map Unit Composition

Extent of the map unit in the survey area: Less than 1 percent
Extent of components in the map unit:
Moenkopie and similar soils—60 percent
Rock outcrop—22 percent
Minor components—18 percent

Minor Components

- Nepalto soils on fan remnants

Descriptions

Moenkopie soils
Landform position: Hills, mesas, and structural benches
Parent material: Eolian deposits derived from sandstone and residuum weathered from sandstone and shale
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Loamy fine sand to very gravelly fine sandy loam

Rock outcrop
Landform position: Escarpments, structural benches, and talus slopes
Parent material: Carmel Formation sandstone and Salt Wash Member (Morrison Formation) sandstone and conglomerate

7—Reef-Rock outcrop-Daklos association, gently sloping to very steep, semiarid

Map Unit Setting

Landform position: Escarpments and talus slopes
Elevation: 3,900 to 8,670 feet (1,183 to 2,627 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 2 to 60 percent

Map Unit Composition

Extent of the map unit in the survey area: 29 percent
Extent of components in the map unit:
Reef and similar soils—25 percent
Rock outcrop—20 percent
Daklos and similar soils—14 percent
Minor components—41 percent

Minor Components

- Simel soils on mountain slopes
- Rizno soils on mountain slopes and structural benches
- Tesihim family soils on hogbacks and structural benches
- Moclom soils on structural benches
- Retsabal soils on dissected pediments and mountain slopes
- Badland areas with no vegetation

Descriptions

Reef soils
Landform position: Structural benches, mesas, and mountain slopes
Parent material: Slope alluvium derived from sandstone and siltstone and residuum weathered from sandstone and siltstone
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Very channery fine sandy loam

Rock outcrop
Landform position: Structural benches, mesas, and mountain slopes
Parent material: Moenkopi Formation sandstone and siltstone and Carmel Formation sandstone and limestone

Daklos soils
Landform position: Structural benches, mesas, and mountain slopes
Parent material: Residuum weathered from sandstone and arenaceous limestone
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Very channery sandy loam

8—Nizhoni-Rock outcrop-Kydestea association, gently sloping to steep, dry subhumid

Map Unit Setting

Landform position: Mesas, structural benches, and mountain slopes
Elevation: 5,330 to 7,940 feet (1,614 to 2,405 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Slope: 2 to 45 percent

Map Unit Composition

Extent of the map unit in the survey area: 10 percent
Extent of components in the map unit:
Nizhoni and similar soils—42 percent
Rock outcrop—20 percent
Kydestea and similar soils—12 percent
Minor components—26 percent

Minor Components

- Parkwash soils on structural benches and mesas
- Pinepoint soils on sand sheets
- Plumasano soils on mesas

Descriptions

Nizhoni soils
Landform position: Structural benches
Parent material: Residuum weathered from sandstone
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Surface layer texture: Fine sandy loam

Rock outcrop
Landform position: Cliffs and structural benches
Parent material: Kayenta Formation sandstone and Moenkopi Formation sandstone and siltstone

Kydestea soils
Landform position: Pediments and mountain slopes
Parent material: Colluvial deposits derived from sandstone and residuum weathered from sandstone

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Surface layer texture: Very gravelly fine sandy loam to gravelly sandy clay loam

Deep Eolian and Slope Alluvium Soils on Mesas and Structural Benches

9—Seeg-Moffat-Needle association, gently sloping to moderately steep, arid

Map Unit Setting

Landform position: Hills, mesas, and structural benches
Elevation: 4,200 to 4,880 feet (1,274 to 1,478 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Slope: 2 to 30 percent

Map Unit Composition

Extent of the map unit in the survey area: Less than 1 percent
Extent of components in the map unit:
Seeg and similar soils—40 percent
Moffat and similar soils—30 percent
Needle and similar soils—25 percent
Minor components—5 percent

Minor Components

- Rock outcrop on structural benches
- Sheppard soils on stream terraces

Descriptions

Seeg soils
Landform position: High stream terraces and strath terraces
Parent material: Alluvial and colluvial deposits derived from igneous and sedimentary rock
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Loamy sand

Moffat soils
Landform position: Hills, stream terraces, and strath terraces
Parent material: Eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sand

Needle soils
Landform position: Hills, mesas, and structural benches
Parent material: Eolian deposits derived from sandstone and residuum weathered from sandstone
Depth class: Shallow
Drainage class: Excessively drained

Permeability: Rapid
Surface layer texture: Fine sand

10—Mivida-Begay-Barx association, nearly level to strongly sloping, semiarid

Map Unit Setting

Landform position: Escarpments and talus slopes
Elevation: 5,030 to 7,100 feet (1,525 to 2,153 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 1 to 15 percent

Map Unit Composition

Extent of the map unit in the survey area: 3 percent
Extent of components in the map unit:
Mivida and similar soils—24 percent
Begay and similar soils—17 percent
Barx and similar soils—13 percent
Minor components—46 percent

Minor Components

- Rock outcrop on structural benches
- Remorris soils on structural benches
- Mido soils on dunes and sand sheets
- Ignacio soils on hills
- Retsabal soils on hills

Descriptions

Mivida soils
Landform position: Fan terraces
Parent material: Alluvial deposits derived from sandstone and eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Loamy fine sand

Begay soils
Landform position: Stream terraces
Parent material: Alluvial deposits derived from sandstone and eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sandy loam

Barx soils
Landform position: Alluvial flats
Parent material: Reworked eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Surface layer texture: Fine sandy loam

11—Mezzo family loamy fine sand, nearly level to moderately steep, dry subhumid

Map Unit Setting

Landform position: Hills, mesas, and structural benches
Elevation: 6,470 to 7,700 feet (1,961 to 2,332 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Slope: 2 to 20 percent

Map Unit Composition

Extent of the map unit in the survey area: Less than 1 percent
Extent of components in the map unit:
Mezzo family and similar soils—80 percent
Minor components—20 percent

Minor Components

- Strell family soils on structural benches
- Rock outcrop on domes and structural benches

Description

Mezzo family soils
Landform position: Sand sheets and dunes on mesas
Parent material: Eolian deposits derived from sandstone
Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Surface layer texture: Loamy fine sand

Rock Outcrop on Cuestas, Mesas, and Structural Benches

12—Rock outcrop-Needle complex, gently sloping to moderately steep, arid

Map Unit Setting

Landform position: Hills, mesas, and structural benches
Elevation: 3,940 to 4,950 feet (1,194 to 1,501 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Slope: 2 to 30 percent

Map Unit Composition

Extent of the map unit in the survey area: Less than 1 percent
Extent of components in the map unit:
Rock outcrop—60 percent
Needle and similar soils—35 percent
Minor components—15 percent

Minor Components

- Soils that have rock fragments throughout the profile on hills and mesas
- Soils more than 20 inches deep to bedrock on structural benches

Descriptions

Rock outcrop
Landform position: Structural benches and domes
Parent material: Navajo Sandstone, Wingate Sandstone, and Cedar Mesa Sandstone

Needle soils
Landform position: Hills, mesas, and structural benches
Parent material: Eolian deposits derived from sandstone
Depth class: Shallow
Drainage class: Excessively drained
Permeability: Very rapid
Surface layer texture: Sand

13—Rock outcrop-Nalcase-Arches association, gently sloping to moderately steep, semiarid

Map Unit Setting

Landform position: Cuestas, domes, structural benches, and mesas
Elevation: 3,940 to 7,650 feet (1,194 to 2,319 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 2 to 30 percent

Map Unit Composition

Extent of the map unit in the survey area: 19 percent
Extent of components in the map unit:
Rock outcrop—55 percent
Nalcase and similar soils—18 percent
Arches and similar soils—7 percent
Minor components—20 percent

Minor Components

- Santrick soils on sand sheets on structural benches
- Mathis soils on talus slopes

Descriptions

Rock outcrop
Landform position: Structural benches, domes, and cliffs
Parent material: Navajo Sandstone and Salt Wash Member (Morrison Formation) sandstone and conglomerate

Nalcase soils
Landform position: Coppice mounds on cuestas and structural benches
Parent material: Eolian deposits derived from sandstone and residuum weathered from sandstone
Depth class: Shallow
Drainage class: Somewhat excessively drained
Permeability: Rapid
Surface layer texture: Fine sand

Arches soils
Landform position: Structural benches

Parent material: Eolian deposits derived from sandstone and residuum weathered from sandstone
Depth class: Shallow
Drainage class: Somewhat excessively drained
Permeability: Rapid
Surface layer texture: Loamy fine sand

14—Rock outcrop-Mezzo family-Strell family complex, gently sloping to steep, dry subhumid

Map Unit Setting

Landform position: Cuestas, domes, structural benches, and mesas
Elevation: 6,100 to 9,030 feet (1,847 to 2,735 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Slope: 2 to 45 percent

Map Unit Composition

Extent of the map unit in the survey area: 2 percent
Extent of components in the map unit:
Rock outcrop—50 percent
Mezzo family and similar soils—30 percent
Strell family and similar soils—15 percent
Minor components—5 percent

Minor Components

- Mathis soils on talus slopes
- Riverwash areas with no vegetation

Descriptions

Rock outcrop
Landform position: Structural benches, domes, and cliffs
Parent material: Navajo Sandstone

Mezzo family soils
Landform position: Sand sheets and dunes on mesas and structural benches
Parent material: Eolian deposits derived from sandstone and slope alluvium derived from sandstone
Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Surface layer texture: Loamy fine sand

Strell family soils
Landform position: Coppice mounds on structural benches
Parent material: Eolian deposits derived from sandstone and residuum weathered from sandstone
Depth class: Shallow
Drainage class: Somewhat excessively drained
Permeability: Rapid
Surface layer texture: Loamy fine sand

Basalt Terrace Deposits on Alluvial Fan Remnants, Pediments, and Strath Terraces

15—Remorris-Milok-Strych association, nearly level to very steep, semiarid

Map Unit Setting

Landform position: Hills, mesas, and structural benches
Elevation: 4,980 to 7,520 feet (1,509 to 2,280 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 1 to 60 percent

Map Unit Composition

Extent of the map unit in the survey area: 6 percent
Extent of components in the map unit:
Remorris and similar soils—21 percent
Milok and similar soils—17 percent
Strych and similar soils—16 percent
Minor components—46 percent

Minor Components

- Beclabito soils on hillslopes
- Rock outcrop on mesas and structural benches
- Lybrook, saline-sodic soils on hillslopes
- Begay soils on pediments

Descriptions

Remorris soils
Landform position: Hills, mesas, and structural benches
Parent material: Slope alluvium derived from sandstone and siltstone and residuum weathered from sandstone and siltstone
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Surface layer texture: Channery loam

Milok soils
Landform position: Dissected hillslopes and pediments
Parent material: Alluvial deposits derived from sandstone and basalt
Depth class: Deep or very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sandy loam

Strych soils
Landform position: Mesas and pediments
Parent material: Alluvial deposits derived from basalt
Depth class: Deep or very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Gravelly very fine sandy loam

16—Foy-Whitesage families complex, gently sloping to steep, dry subhumid

Map Unit Setting

Landform position: Mountain slopes, mesas, and structural benches
Elevation: 6,110 to 9,030 feet (1,851 to 2,735 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Slope: 2 to 35 percent

Map Unit Composition

Extent of the map unit in the survey area: 1 percent
Extent of components in the map unit:
Foy family and similar soils—50 percent
Whitesage family and similar soils—45 percent
Minor components—5 percent

Minor Components

- Deep and very deep, clayey, saline soils in depressions on mountain slopes

Descriptions

Foy family soils
Landform position: Hills, mesas, and structural benches
Parent material: Alluvium derived from basalt
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately slow
Surface layer texture: Stony fine sandy loam to clay loam

Whitesage family soils
Landform position: Dissected hillslopes and pediments
Parent material: Alluvial deposits derived from basalt and residuum weathered from sandstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Surface layer texture: Gravelly fine sandy loam

Gypsum Soils on Hills and Cuestas

17—Goblin-Ivanpatch association, gently sloping to very steep, arid

Map Unit Setting

Landform position: Hills and cuestas
Elevation: 5,020 to 6,650 feet (1,521 to 2,016 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Slope: 2 to 70 percent

Map Unit Composition

Extent of the map unit in the survey area: 4 percent
Extent of components in the map unit:
Goblin and similar soils—70 percent

Ivanpatch and similar soils—8 percent
Minor components—22 percent

Minor Components

- Swell soils on hills
- Mussentuchit soils on hills
- Clapper soils on pediment remnants

Descriptions

Goblin soils
Landform position: Hills and cuestas
Parent material: Residuum weathered from gypsum rock
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sandy loam

Ivanpatch soils
Landform position: Hills and cuestas
Parent material: Eolian deposits and pedisediment derived from sandstone and residuum weathered from gypsum rock
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Loamy fine sand

18—Retsabal-Lavodnas association, strongly sloping to steep, semiarid

Map Unit Setting

Landform position: Hills and cuestas
Elevation: 5,600 to 7,070 feet (1,696 to 2,141 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 9 to 60 percent

Map Unit Composition

Extent of the map unit in the survey area: 2 percent
Extent of components in the map unit:
Retsabal and similar soils—47 percent
Lavodnas and similar soils—30 percent
Minor components—23 percent

Minor Components

- Lemrac soils on hills and cuestas
- Rock outcrop on escarpments

Descriptions

Retsabal soils
Landform position: Hills, cuestas, and structural benches
Parent material: Eolian deposits derived from sandstone and shale and residuum weathered from gypsum rock
Depth class: Shallow
Drainage class: Well drained

Permeability: Moderately rapid
Surface layer texture: Fine sand to loam

Lavodnas soils
Landform position: Hills and cuestas
Parent material: Slope alluvium derived from shale and residuum weathered from gypsum rock
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Surface layer texture: Silt loam

Residual and Slope Alluvium Soils Derived from Shale on Hills and Pediments

19—Badland-Hanksville-Notal-Emco family association, nearly level to very steep, arid

Map Unit Setting

Landform position: Hills and cuestas
Elevation: 4,950 to 6,060 feet (1,499 to 1,835 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Slope: 2 to 60 percent

Map Unit Composition

Extent of the map unit in the survey area: 1 percent
Extent of components in the map unit:
Badland—27 percent
Hanksville and similar soils—24 percent
Notal and similar soils—17 percent
Emco family and similar soils—16 percent
Minor components—16 percent

Minor Components

- Chipeta, saline-sodic soils on hills

Descriptions

Badland
Landform position: Hills
Parent material: Brushy Basin Member (Morrison Formation) shale and mudstone

Hanksville soils
Landform position: Pediments and alluvial flats
Parent material: Pedisediment derived from shale and residuum weathered from shale
Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately slow
Surface layer texture: Silt loam

Notal soils
Landform position: Pediments and alluvial flats

Parent material: Pedisediment derived from shale and residuum weathered from shale
Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Surface layer texture: Fine sandy loam

Emco family soils
Landform position: Hills
Parent material: Colluvium derived from sandstone and shale and residuum weathered from mudstone
Depth class: Shallow
Drainage class: Well drained
Permeability: Slow
Surface layer texture: Clay

20—Querencia-Lybrook complex, nearly level to steep, semiarid

Map Unit Setting

Landform position: Hills and cuestas
Elevation: 5,030 to 6,020 feet (1,525 to 1,824 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 2 to 35 percent

Map Unit Composition

Extent of the map unit in the survey area: 1 percent
Extent of components in the map unit:
Querencia and similar soils—50 percent
Lybrook and similar soils—30 percent
Minor components—20 percent

Minor Components

- Hanksville soils on base slopes

Descriptions

Querencia soils
Landform position: Hills and pediments
Parent material: Slope alluvium derived from shale and residuum weathered from shale
Depth class: Deep
Drainage class: Well drained
Permeability: Moderately slow
Surface layer texture: Loam

Lybrook soils
Landform position: Hills and pediments
Parent material: Slope alluvium derived from shale and residuum weathered from shale
Depth class: Moderately deep to very deep
Drainage class: Well drained
Permeability: Slow
Surface layer texture: Silty clay loam

Irrigated Orchard Soils

21—Tineoyler-Mulford-Sulphurcreek association, nearly level to gently sloping, semiarid

Map Unit Setting

Landform position: Stream terraces
Elevation: 5,390 to 5,550 feet (1,635 to 1,683 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 0 to 5 percent

Map Unit Composition

Extent of the map unit in the survey area: Less than 1 percent
Extent of components in the map unit:
Tineoyler and similar soils—54 percent
Mulford and similar soils—20 percent
Sulphurcreek and similar soils—18 percent
Minor components—8 percent

Minor Components

- Soils with more than 35 percent coarse fragments throughout, on stream terraces

Descriptions

Tineoyler soils
Landform position: Stream terraces
Parent material: Alluvium derived from sandstone and mixed igneous rocks
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Surface layer texture: Loam

Mulford soils
Landform position: Stream terraces
Parent material: Alluvium derived from sandstone and mixed igneous rocks
Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Surface layer texture: Silty clay loam

Sulphurcreek soils
Landform position: Stream terraces
Parent material: Alluvium derived from sandstone and mixed igneous rocks
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Surface layer texture: Loam

Riparian Soils in Canyons and Gorges

22—Radnik-Pherson family-Notom-Sandyranch association, nearly level to moderately steep, semiarid

Map Unit Setting

Landform position: Stream terraces and flood-plain steps
Elevation: 3,940 to 6,790 feet (1,193 to 2,057 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Slope: 1 to 20 percent

Map Unit Composition

Extent of the map unit in the survey area: Less than 1 percent
Extent of components in the map unit:
- Radnik and similar soils—25 percent
- Pherson family and similar soils—14 percent
- Notom and similar soils—13 percent
- Sandyranch and similar soils—11 percent
- Minor components—37 percent

Minor Components

- Riverwash in channels with no vegetation
- Bowington soils on flood plains
- Begay, moist soils on stream terraces

Descriptions

Radnik soils
Landform position: Stream terraces and flood-plain steps
Parent material: Alluvium derived from sandstone and mixed igneous rocks
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sandy loam

Pherson family soils
Landform position: Flood-plain steps
Parent material: Alluvium derived from sandstone and mixed igneous rocks
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Surface layer texture: Fine sandy loam

Notom soils
Landform position: Flood-plain steps
Parent material: Alluvium derived from sandstone and mixed igneous rocks
Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Surface layer texture: Loamy fine sand and fine sand

Sandyranch soils
Landform position: Flood-plain steps
Parent material: Alluvium and reworked eolian material derived from sandstone
Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Surface layer texture: Loamy fine sand

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the park. 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. Table 4 shows the taxonomic classification for each soil in the survey area.

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 Emco family soil in Badland-Emco family complex, 10 to 60 percent slopes.

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 Goblin fine sandy loam, 15 to 70 percent slopes. Goblin is identified as a taxadjunct in table 4.

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, Begay fine sandy loam, 1 to 15 percent slopes, moist, is a phase of the Begay series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Reef-Rock outcrop complex, 15 to 60 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 Rock outcrop component in Rock outcrop-Nalcase complex, 2 to 30 percent slopes, is an example.

Table 5 gives the acreage and proportionate extent of each map unit in the park. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

1—Abra-Sazi-Strych complex, 1 to 5 percent slopes, moist

Map Unit Setting

General setting: Upper Cathedral Valley
Major land resource area: 35—Colorado Plateau
Elevation: 7,050 to 7,370 feet (2,148 to 2,245 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Abra, moist and similar soils: 30 percent
Sazi, moist and similar soils: 30 percent
Strych, moist and similar soils: 30 percent
Minor components (10 percent) and their ecological sites:
Rizno soils on pediments (shallow, loamy soils); Semidesert Shallow Loam (Utah Juniper-Pinyon)

Description of the Abra, Moist Soil

Note: A moist phase is assigned to this soil to account for the sagebrush ecological site.

Figure 43.—Profile of the Abra soil in map unit 1 (Abra-Sazi-Strych complex, 1 to 5 percent slopes, moist). The calcic horizon begins at a depth of 24 centimeters. Scale is in centimeters.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocalcids (fig. 43)
Landform: Pediments and plateaus (fig. 44)
Geology: Pediment deposits (Pleistocene and Upper Pliocene)
Parent material: Alluvium derived from basalt
Slope: 1 to 5 percent, north to east aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 11.5 (very high)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None

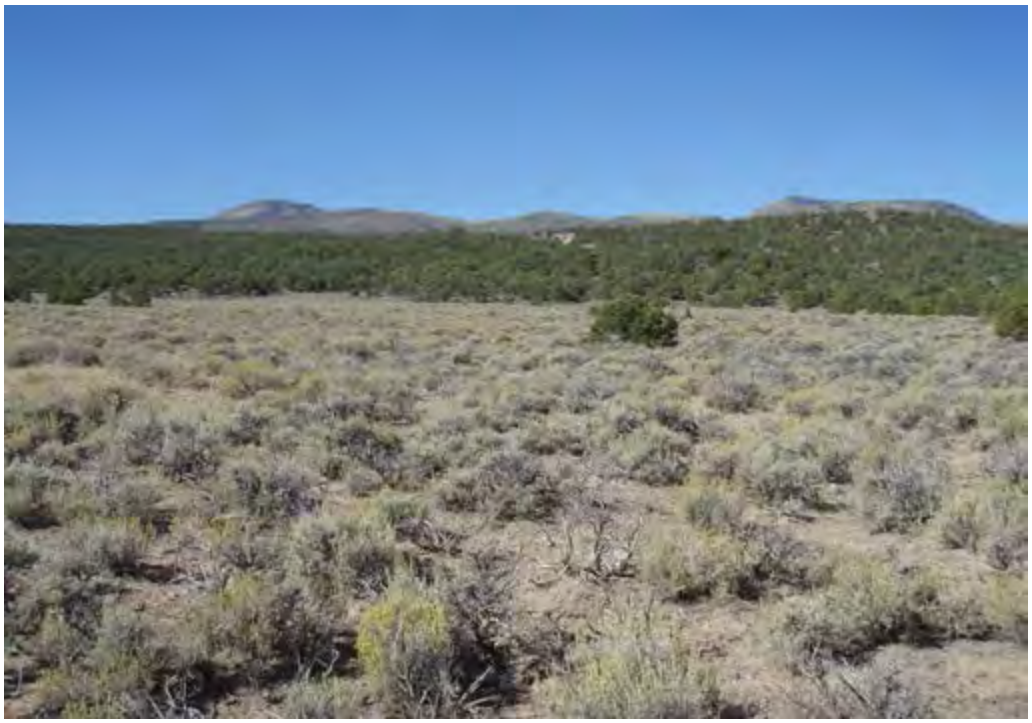

Figure 44.—Landscape of the Abra soil in map unit 1 (Abra-Sazi-Strych complex, 1 to 5 percent slopes, moist). This soil occurs on pediments and plateaus.

Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: C
Calcium carbonate content (maximum): About 40 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY209UT
Present vegetation (in most areas): Wyoming big sagebrush, blue grama, twoneedle pinyon, and plains pricklypear
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	35-45
Litter (<5 mm)	20-30
Rock fragments	0-5
Bare soil	20-30
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 466115 meters E., 4263308 meters N., zone 12

A—0 to 3 inches (0 to 8 centimeters); brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; 14 percent clay; weak medium platy structure; soft, very friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; many medium and many very fine irregular pores; 5 percent gravel; noneffervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Bw—3 to 9.5 inches (8 to 24 centimeters); yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; 17 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, and common medium roots throughout; many very fine and many fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—9.5 to 17 inches (24 to 43 centimeters); light yellowish brown (10YR 6/4) gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; 21 percent clay; weak medium subangular blocky structure; moderately hard, firm, moderately sticky and moderately plastic; common fine and common medium roots throughout; many very fine and many fine irregular pores; common fine irregular carbonate masses in matrix and few fine irregular carbonate masses on bottom of rock fragments; 20 percent gravel and 10 percent cobbles; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bk2—17 to 78.5 inches (43 to 200 centimeters); white (10YR 9.5/1) loam, very pale brown (10YR 8/2) moist; 26 percent clay; weak fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few fine and few medium roots throughout; many very fine and many fine irregular pores; many medium irregular carbonate masses in matrix and common medium irregular carbonate masses around rock fragments; 5 percent gravel; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Value—5 or 6 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam or loam
Clay content—12 to 25 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw horizon:

Hue—7.5YR or 10YR
Chroma—3 or 4, dry or moist
Texture—sandy loam or loam
Clay content—12 to 28 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bk1 horizon:

Hue—7.5YR or 10YR
Value—6 to 8 dry; 4 to 6 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—sandy loam, loam, sandy clay loam, or clay loam
Clay content—15 to 35 percent
Calcium carbonate equivalent—5 to 35 percent

Figure 45.—Landscape of the Sazi soil in map unit 1 (Abra-Sazi-Strych complex, 1 to 5 percent slopes, moist).

Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 35 percent gravel and cobbles

Bk2 horizon:
Hue—7.5YR or 10YR
Value—6 to 9 dry; 4 to 8 moist
Chroma—1 to 4 dry; 2 or 3 moist
Texture—loam, sandy clay loam, or clay loam
Clay content—15 to 35 percent
Calcium carbonate equivalent—10 to 40 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 35 percent gravel and cobbles

Description of the Sazi, Moist Soil

Note: A moist phase is assigned to this soil to account for the sagebrush ecological site.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids
Landform: Pediments and plateaus (fig. 45)
Geology: Pediment deposits (Pleistocene and Upper Pliocene) over the Morrison Formation (Upper Jurrasic), Salt Wash Member
Parent material: Alluvium derived from basalt over residuum weathered from sandstone and siltstone
Slope: 1 to 5 percent, northeast to east aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 20 to 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 5.5 (moderate)
Shrink-swell potential: About 1.5 LEP (low)

Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 35 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY209UT
Present vegetation (in most areas): Wyoming big sagebrush, blue grama, twoneedle pinyon, and plains pricklypear
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	35-45
Litter (<5 mm)	20-30
Rock fragments	0-5
Bare soil	20-30
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 466928 meters E., 4263266 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; 12 percent clay; weak medium platy structure; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial and many very fine irregular pores; 10 percent gravel; very slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear smooth boundary.

Bk1—3.5 to 12.5 inches (9 to 32 centimeters); light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/4) moist; 12 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; many very fine and many fine irregular pores; common fine irregular carbonate masses on bottom of rock fragments; 3 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—12.5 to 29.5 inches (32 to 75 centimeters); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; 16 percent clay; weak coarse subangular blocky structure; slightly hard, friable, moderately sticky and slightly plastic; few fine roots throughout; many very fine and many fine irregular pores; common medium irregular carbonate masses in matrix and common medium irregular carbonate masses on bottom of rock fragments; 3 percent gravel; violently effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; abrupt smooth boundary.

2C—29.5 to 43.5 inches (75 to 110 centimeters); white (2.5Y 8/1) very fine sandy loam, light gray (2.5Y 7/2) moist; 18 percent clay; soft, very friable, very sticky and moderately plastic; few fine roots throughout; many very fine and many fine irregular pores; 10 percent channers; slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; abrupt wavy boundary.

R—43.5 to 53 inches (110 to 135 centimeters); strongly cemented sandstone, conglomerate, or mudstone.

Range in Characteristics

A horizon:
Value—5 or 6 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 20 percent gravel

Bk1 horizon:
Hue—7.5YR or 10YR
Value—6 to 8 dry; 4 to 6 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—sandy loam or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 35 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 20 percent gravel

Bk2 horizon:
Hue—7.5YR or 10YR
Value—6 to 8 dry; 4 to 6 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—sandy loam or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 35 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 20 percent gravel

2C or C horizon:
Texture—very fine sandy loam, fine sandy loam, or sandy loam
Clay content—10 to 20 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 20 percent parachanners

This Sazi soil differs from the Sazi series in that it is deep to bedrock and has hue of 10YR. The Sazi series is moderately deep to bedrock and has hue of 7.5YR and redder.

Description of the Strych, Moist Soil

Note: A moist phase is assigned to this soil to account for the sagebrush ecological site.

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids (fig. 46)
Landform: Pediments and plateaus (fig. 47)
Geology: Pediment deposits (Pleistocene and Upper Pliocene)
Parent material: Alluvium derived from basalt
Slope: 1 to 5 percent, northeast aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 4.5 (low)
Shrink-swell potential: About 1.5 LEP (low)

Figure 46.—Profile of the Strych soil in map unit 1 (Abra-Sazi-Strych complex, 1 to 5 percent slopes, moist). Scale is in centimeters.

Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 45 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY209UT

Figure 47.—Landscape of the Strych soil in map unit 1 (Abra-Sazi-Strych complex, 1 to 5 percent slopes, moist).

Present vegetation (in most areas): Wyoming big sagebrush, blue grama, twoneedle pinyon, and plains pricklypear

Land capability classification (nonirrigated areas): 7s

Ground cover (percent):

Plant canopy	35-45
Litter (<5 mm)	20-30
Rock fragments	0-5
Bare soil	20-30
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 465978 meters E., 4263316 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; 15 percent clay; moderate fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and many medium roots throughout; many medium, many very fine, and many fine irregular pores; 8 percent gravel; very slightly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bk1—4 to 14 inches (10 to 35 centimeters); pale brown (10YR 6/3) stony sandy loam, brown (10YR 4/3) moist; 18 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and many very fine roots throughout; many very fine and many fine irregular pores; common fine spherical carbonate masses in matrix and few fine irregular

carbonate masses on bottom of rock fragments; 13 percent gravel, 10 percent cobbles, and 10 percent stones; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—14 to 78.5 inches (35 to 200 centimeters); light gray (10YR 7/2) very stony coarse sandy loam, brown (10YR 5/3) moist; 16 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; common very fine and common fine irregular pores; many medium irregular carbonate masses in matrix and common coarse irregular carbonate masses on bottom of rock fragments; 25 percent gravel, 10 percent cobbles, and 20 percent stones; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 3 to 6 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 35 percent gravel and cobbles

Bk1 horizon:
Hue—7.5YR or 10YR
Value—5 to 8 dry; 4 to 8 moist
Chroma—1 to 4 dry; 2 to 4 moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 35 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 60 percent gravel, cobbles, and stones

Bk2 horizon:
Hue—7.5YR or 10YR
Value—6 to 8.5 dry; 4 to 8 moist
Chroma—1 to 4 dry; 2 to 4 moist
Texture—sandy loam, fine sandy loam, or coarse sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—10 to 45 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones

2—Aquima fine sandy loam, 1 to 6 percent slopes

Map Unit Setting

General setting: Onion Flats Seep area
Major land resource area: 35—Colorado Plateau
Elevation: 6,440 to 6,780 feet (1,964 to 2,067 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Figure 48.—Profile of the Aquima soil in map unit 2 (Aquima fine sandy loam, 1 to 6 percent slopes). Scale is in centimeters.

Map Unit Composition

Aquima and similar soils: 80 percent
Minor components (20 percent) and their ecological sites:
- Begay, moist soils on alluvial flats (very deep, coarse-loamy soils); Semidesert Loam (Wyoming Big Sagebrush)
- Strych, moist soils on alluvial flats (very deep, loamy-skeletal soils with calcic horizons); Semidesert Loam (Wyoming Big Sagebrush)

Description of the Aquima Soil

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 48)
Landform: Alluvial flats (fig. 49)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone and shale and/or slope alluvium derived from sandstone and shale
Slope: 1 to 6 percent, northeast to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 11.8 (very high)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None

Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: B
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY209UT
Present vegetation (in most areas): Russian wildrye, Wyoming big sagebrush, crested wheatgrass, and fourwing saltbush
Land capability classification (nonirrigated areas): 6e
Ground cover (percent): (fig. 50)

Plant canopy	25-35
Litter (<5 mm)	15-25
Rock fragments	0-10
Bare soil	35-50
Cyanobacteria crust	0
Lichen crust	0
Moss crust	5-10
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 491733 meters E., 4198015 meters N., zone 12

Figure 49.—Landscape of the Aquima soil in map unit 2 (Aquima fine sandy loam, 1 to 6 percent slopes). This soil occurs on alluvial flats in the Onion Flats area.

Figure 50.—Typical surface of the Aquima soil in map unit 2 (Aquima fine sandy loam, 1 to 6 percent slopes).

A—0 to 3 inches (0 to 7 centimeters); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; 18 percent clay; weak thick platy structure; moderately hard, firm, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; many carbonate coats on bottom surfaces of rock fragments; 2 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bw—3 to 8 inches (7 to 20 centimeters); reddish brown (5YR 5/4) fine sandy loam, yellowish red (5YR 4/6) moist; 19 percent clay; moderate coarse subangular blocky structure parting to moderate fine subangular blocky; moderately hard, firm, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; many carbonate coats on bottom surfaces of rock fragments; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bk1—8 to 19.5 inches (20 to 50 centimeters); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; 22 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine irregular pores; many carbonate coats on bottom surfaces of rock fragments; common fine irregular carbonate masses in matrix; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk2—19.5 to 33.5 inches (50 to 85 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 and nonplastic; common fine and common very fine roots throughout; common very fine irregular pores; many carbonate coats on bottom surfaces of rock fragments; common fine irregular carbonate masses in matrix; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk3—33.5 to 63 inches (85 to 160 centimeters); yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; 24 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; common very fine irregular pores; many carbonate coats on bottom surfaces of rock fragments; common fine irregular carbonate masses in matrix; 8 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C—63 to 75 inches (160 to 190 centimeters); reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; 26 percent clay; massive; moderately hard, firm, slightly sticky and nonplastic; common fine roots throughout; many very fine irregular pores; many carbonate coats on bottom surfaces of rock fragments; 5 percent gravel; strongly effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

A horizon:
Hue—5YR or 7.5YR
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or very fine sandy loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—10 to 15 percent
Rock fragments—0 to 10 percent gravel

Bw horizon:
Hue—5YR or 7.5YR
Chroma—3 to 6, dry or moist
Texture—fine sandy loam or loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—10 to 15 percent
Rock fragments—0 to 10 percent gravel

Bk horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 to 6, dry or moist
Texture—sandy clay loam or loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—10 to 15 percent
Rock fragments—0 to 10 percent gravel

C horizon:
Hue—5YR or 7.5YR
Chroma—4 or 6, dry or moist
Texture—sandy clay loam or loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—10 to 15 percent
SAR—0 to 5
Rock fragments—0 to 10 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

3—Arches-Mido-Rock outcrop complex, 2 to 15 percent slopes

Map Unit Setting

General setting: East side of Meeks Mesa
Major land resource area: 35—Colorado Plateau

Figure 51.—Profile of the Arches soil in map unit 3 (Arches-Mido-Rock outcrop complex, 2 to 15 percent slopes). Bedrock is at a depth of 40 centimeters. Scale is in centimeters.

Elevation: 6,040 to 7,330 feet (1,840 to 2,233 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Arches and similar soils: 45 percent
Mido and similar soils: 25 percent
Rock outcrop, Kayenta and Wingate Formations sandstone: 15 percent
Minor components (15 percent) and their ecological sites:
- Rizno soils on mesas (shallow, loamy soils); Semidesert Shallow Loam (Utah Juniper-Pinyon)
- Begay soils on mesas (very deep, coarse-loamy soils); Semidesert Sandy Loam (Fourwing Saltbush)

Description of the Arches Soil

Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 51)
Landform: Structural benches and mesas (fig. 52)
Geology: Eolian deposits (Quaternary)
Parent material: Eolian deposits derived from sandstone
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Excessively drained
Slowest permeability: More than 20 in/hr (very rapid)

Available water capacity (total inches): About 0.8 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sand (Utah Juniper-Pinyon)
Ecological site number: R035XY227UT
Present vegetation (in most areas): Utah juniper, fourwing saltbush, needle and thread, twoneedle pinyon, blue grama, Indian ricegrass, and sandhill muhly
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	35-45
Litter (<5 mm)	5-15
Rock fragments	0-5
Bare soil	40-50
Cyanobacteria crust	5-10
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 472664 meters E., 4243706 meters N., zone 12

Figure 52.—Landscape of the Arches soil in map unit 3 (Arches-Mido-Rock outcrop complex, 2 to 15 percent slopes). This soil occurs on structural benches.

A—0 to 3 inches (0 to 8 centimeters); red (2.5YR 5/6) fine sand, red (2.5YR 4/6) moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; noneffervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C—3 to 9.5 inches (8 to 24 centimeters); red (2.5YR 5/6) fine sand, red (2.5YR 4/6) moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; noneffervescent; moderately alkaline, pH 8.2; very abrupt smooth boundary.

R—9.5 to 19.5 inches (24 to 49 centimeters); indurated sandstone.

Range in Characteristics

A horizon:

Hue—2.5YR or 5YR
Texture—fine sand or loamy fine sand
Clay content—2 to 6 percent
Calcium carbonate equivalent—0 to 3
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon:

Hue—2.5YR or 5YR
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—2 to 6 percent
Calcium carbonate equivalent—0 to 3
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Mido Soil

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 53)
Landform: Dunes on mesas and dunes on structural benches (fig. 54)
Geology: Eolian deposits (Quaternary)
Parent material: Eolian deposits derived from sandstone
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: More than 20 in/hr (very rapid)
Available water capacity (total inches): About 5.8 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sand (Fourwing Saltbush)
Ecological site number: R035XY212UT
Present vegetation (in most areas): Needle and thread, fourwing saltbush, blue grama, Indian ricegrass, sandhill muhly, nodding buckwheat, and winterfat
Land capability classification (nonirrigated areas): 7s

Figure 53.—Profile of the Mido soil in map unit 3 (Arches-Mido-Rock outcrop complex, 2 to 15 percent slopes). Scale is in centimeters.

Ground cover (percent):

Plant canopy	35-45
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	30-45
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 472265 meters E., 4243323 meters N., zone 12

Figure 54.—The Mido soil on a dune on a structural bench in map unit 3 (Arches-Mido-Rock outcrop complex, 2 to 15 percent slopes).

A—0 to 3.5 inches (0 to 9 centimeters); reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6) moist; 2 percent clay; weak very thick platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots throughout; many very fine irregular pores; noneffervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C1—3.5 to 19.5 inches (9 to 49 centimeters); light red (2.5YR 6/6) fine sand, red (2.5YR 5/6) moist; 2 percent clay; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—19.5 to 73 inches (49 to 185 centimeters); red (2.5YR 5/6) fine sand, red (2.5YR 4/6) moist; 4 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine and few coarse roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Texture—fine sand or loamy fine sand
Clay content—2 to 6 percent
Calcium carbonate equivalent—0 to 1 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizons:

Value—5 or 6 dry; 4 or 5 moist

Texture—fine sand or loamy fine sand
Clay content—2 to 6 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Rock Outcrop, Kayenta and Wingate Formations Sandstone

This component is characterized by nearly level to strongly sloping rock outcrop with discontinuous cliffs and escarpments. The lithology is sandstone. The vertical relief is commonly a few feet, and the continuity of the cliffs is broken. Typically, there are enough cliffs to impede vehicular travel to some degree. The area can be negotiated by full-sized four-wheeled vehicles with difficulty. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of the rock outcrop include potholes in which water may pond for brief periods after rain.

4—Badland-Emco family complex, 10 to 60 percent slopes

Map Unit Setting

General setting: West of North Blue Flats, Bentonite Hills area (fig. 55)
Major land resource area: 35—Colorado Plateau
Elevation: 5,080 to 6,020 feet (1,549 to 1,835 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Badland, Morrison Formation, Brushy Basin Member: 50 percent
Emco family and similar soils: 30 percent
Minor components (20 percent) and their ecological sites:
Emco family soils with a surface mantle of pediment deposits (basalt) on hills (shallow, loamy soils); Desert Shallow Sandy Loam (Shadscale)

Description of the Badland, Morrison Formation, Brushy Basin Member

This component consists of areas of steep, barren exposures of shale or mudstone, usually devoid of vegetation, which are dissected by many intermittent drainage channels. Shallow gullies and severe rilling of the surface are common.

Description of the Emco Family Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau whereas the Emco series occurs in MLRA 34B—Warm Central Desertic Basins and Plateaus.

Taxonomic classification: Clayey, smectitic, calcareous, mesic, shallow Typic Torriorthents (fig. 56)
Landform: Hills
Geology: Morrison Formation (Jurassic), Brushy Basin Member
Parent material: Colluvium derived from sandstone and shale over residuum weathered from mudstone

Figure 55.—Landscape of map unit 4 (Badland-Emco family complex, 10 to 60 percent slopes) in the Bentonite Hills.

Slope: 10 to 60 percent, southeast to west aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 8 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 1.4 (very low)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 30 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 10 SAR (slightly sodic)
Ecological site name: Desert Shallow Clay (Shadscale)
Ecological site number: R035XY125UT
Present vegetation (in most areas): Broom snakeweed, galleta, shadscale, valley saltbush, Bigelow sage, desert princesplume, and Indian ricegrass
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	5-15
Litter (<5 mm)	0-5
Rock fragments	25-35
Bare soil	55-75
Cyanobacteria crust	0
Lichen crust	0

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 485126 meters E., 4247125 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); pale yellow (5Y 7/3) clay, light olive gray (5Y 6/2) moist; 41 percent clay; weak very fine subangular blocky structure; slightly hard, friable, very sticky and very plastic; common medium, many very fine, and many fine irregular pores; 5 percent gravel; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Figure 56.—Profile of the Emco family soil in map unit 4 (Badland-Emco family complex, 10 to 60 percent slopes). Soft bedrock is at a depth of 37 centimeters. Scale is in centimeters.

C1—2 to 7.5 inches (5 to 19 centimeters); 15 percent pale red (10R 6/2) and 85 percent pale yellow (5Y 8/2) clay, 15 percent weak red (10R 5/4) and 85 percent pale olive (5Y 6/3) moist; 45 percent clay; moderate coarse subangular blocky structure; moderately hard, friable, very sticky and very plastic; many very fine and many fine irregular pores; very slightly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

C2—7.5 to 14.5 inches (19 to 37 centimeters); pale yellow (5Y 8/2) parachannery clay, light gray (5Y 7/2) moist; 43 percent clay; weak medium subangular blocky structure; moderately hard, friable, very sticky and very plastic; many very fine and common fine irregular pores; 30 percent gravel; very slightly effervescent; strongly alkaline, pH 8.8; clear smooth boundary.

Cr—14.5 to 24.5 inches (37 to 62 centimeters); weakly cemented mudstone.

Range in Characteristics

A or surface C horizon:

Hue—10R, 10YR, 2.5Y, or 5Y
Value—6 or 7 dry; 4 to 7 moist
Chroma—3 to 4 dry; 2 or 3 moist
Texture—clay loam or clay
Clay content—35 to 45 percent
Calcium carbonate equivalent—0 to 10 percent
Gypsum content—0 to 2 percent
SAR—0 to 5
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 15 percent gravel or paragravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Lower C horizons:

Hue—10R, 2.5Y, or 5Y
Value—5 to 8 dry; 4 to 7 moist
Chroma—2 to 4, dry or moist
Clay content—40 to 50 percent
Calcium carbonate equivalent—0 to 10 percent
Gypsum content—0 to 2 percent
SAR—0 to 10
Electrical conductivity—8 to 30 mmhos/cm
Rock fragments—0 to 35 percent paragravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

5—Barx-Remorris complex, 5 to 45 percent slopes

Map Unit Setting

General setting: Areas adjacent to Grand Staircase-Escalante National Monument and structural benches and escarpments near Circle Cliffs
Major land resource area: 35—Colorado Plateau
Elevation: 5,300 to 6,960 feet (1,616 to 2,121 meters)
Mean annual precipitation: 9 to 12 inches (229 to 305 millimeters)
Mean annual air temperature: 45 to 52 degrees F (7.0 to 11.0 degrees C)
Mean annual soil temperature: 47 to 54 degrees F (8.1 to 12.1 degrees C)
Frost-free period: 120 to 160 days

Map Unit Composition

Barx and similar soils: 55 percent
Remorris and similar soils: 20 percent

Minor components (25 percent) and their ecological sites:
- Begay, moist soils on alluvial flats and footslopes of escarpments (very deep, coarse-loamy soils with cambic horizons); Semidesert Loam (Wyoming Big Sagebrush)
- Shallow, loamy soils with argillic horizons on hills (ustic aridic, mesic)
- Badland with no vegetation
- Deep and very deep, loamy soils with calcic horizons on base slopes and hills (semidesert, mesic)

Description of the Barx Soil

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Calciargids
Landform: Alluvial flats
Geology: Alluvium and dune deposits (Quaternary)
Parent material: Reworked eolian material
Slope: 5 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 7.0 (moderate)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: B
Calcium carbonate content (maximum): About 40 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY209UT
Present vegetation (in most areas): Wyoming big sagebrush, galleta, Indian ricegrass, bottlebrush squirreltail, winterfat, and other shrubs
Land capability classification (nonirrigated areas): 6e

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 450552 meters E., 4171230 meters N., zone 12

A—0 to 5 inches (0 to 13 centimeters); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak coarse platy structure; soft, friable; many very fine, many fine, and few medium roots; few medium, common very fine, and common fine pores; slightly alkaline, pH 7.8; clear smooth boundary.

Bt—5 to 12 inches (13 to 30 centimeters); yellowish red (5YR 5/6) sandy clay loam, reddish brown (5YR 4/4) moist; moderate subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine, common fine, and few medium roots; few medium, common very fine, and common fine pores; moderately alkaline, pH 7.9; clear wavy boundary.

Bw—12 to 31 inches (30 to 79 centimeters); reddish yellow (5YR 6/6) sandy loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, and common medium roots; common medium, many very fine, and many fine pores; moderately alkaline, pH 8.1; clear smooth boundary.

Bk—31 to 48 inches (79 to 122 centimeters); light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; massive; slightly hard, friable; few very fine,

few fine, and few medium roots; few medium and common very fine and common fine pores; moderately alkaline, pH 8.4; clear smooth boundary.

C—48 to 60 inches (122 to 152 centimeters); light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; massive; soft, friable; few fine and few very fine roots; few very fine and few fine pores; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content: 18 to 27 percent

A horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 to 6, dry or moist
Clay content—8 to 18 percent
Rock fragments—0 to 15 percent gravel

Bt horizon and Btk horizon (if it occurs):
Hue—5YR or 7.5YR
Value—4 to 6 dry; 4 or 5 moist
Chroma—4 to 6, dry or moist
Texture—loam or sandy clay loam
Clay content—18 to 27 percent
Rock fragments—5 to 15 percent gravel
Calcium carbonate equivalent—0 to 15 percent

Bw horizon (if it occurs):
Hue—5YR or 7.5YR
Chroma—3 to 6, dry or moist
Texture—fine sandy loam, sandy loam, or loam
Clay content—8 to 18 percent
Rock fragments—0 to 15 percent gravel

Bk horizons:
Hue—5YR or 7.5YR
Value—6 to 8 dry; 4 to 6 moist
Chroma—4 to 6, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—18 to 27 percent
Rock fragments—0 to 15 percent gravel
Calcium carbonate equivalent—15 to 40 percent

C horizon (if it occurs):
Hue—5YR or 7.5YR
Texture—fine sandy loam or sandy loam
Clay content—8 to 18 percent
Rock fragments—5 to 15 percent gravel

Description of the Remorris Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents
Landform: Structural benches
Geology: Chinle Formation (Triassic)
Parent material: Colluvium derived from sandstone and siltstone over residuum weathered from sandstone and siltstone
Slope: 25 to 45 percent, north aspect

Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 2.6 (low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 20 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 2 SAR (slightly sodic)
Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Ecological site number: R035XY240UT
Present vegetation (in most areas): Utah juniper, roundleaf buffaloberry, Utah serviceberry, Indian ricegrass, twoneedle pinyon, broom snakeweed, galleta, other shrubs, and singleleaf ash
Land capability classification (nonirrigated areas): 7s

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 462191 meters E., 4156526 meters N., zone 12

A—0 to 3 inches (0 to 8 centimeters); red (2.5YR 5/6) silty clay loam, red (2.5YR 4/6) moist; 30 percent clay; strong very fine granular and strong fine granular structure; soft, very friable, moderately sticky and moderately plastic; few fine and common very fine roots; many very fine and common fine pores; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.
C1—3 to 10 inches (8 to 25 centimeters); reddish brown (2.5YR 4/4) silty clay loam, reddish brown (2.5YR 4/4) moist; 30 percent clay; massive; hard, firm, moderately sticky and moderately plastic; few fine and few very fine roots; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; gradual wavy boundary.
C2—10 to 15 inches (25 to 38 centimeters); red (2.5YR 5/6) silty clay loam, red (2.5YR 4/6) moist; 30 percent clay; massive; very hard, very firm, moderately sticky and moderately plastic; few very fine and few medium roots; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.
Cr—15 inches (38 centimeters); moderately cemented sandstone and siltstone.

Range in Characteristics

Clay content: 20 to 35 percent
Rock fragments: 0 to 35 percent gravel and channers

A horizon:
Hue—2.5YR or 5YR
Value—4 to 6 dry; 4 or 5 moist
Chroma—3 to 6, dry or moist

C horizons:
Hue—2.5YR or 5YR
Value—4 to 6 dry; 4 or 5 moist
Chroma—3 to 6, dry or moist
Texture—silty clay loam, clay loam, silt loam, or loam
Clay content—20 to 35 percent

6—Beclabito-Lybrook, saline-sodic, complex, 10 to 40 percent slopes

Map Unit Setting

General setting: Cathedral Valley
Major land resource area: 35—Colorado Plateau
Elevation: 4,950 to 6,820 feet (1,509 to 2,080 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Beclabito and similar soils: 55 percent
Lybrook, saline-sodic and similar soils: 30 percent
Minor components (15 percent) and their ecological sites:
- Remorris soils on hills (shallow, loamy soils); Semidesert Shallow Clay (Shadscale-Utah Juniper)
- Moderately deep and deep, fine-loamy soils on hills; Semidesert Loam (Shadscale)
- Moderately deep to very deep, loamy-skeletal soils with calcic horizons on pediment remnants; Semidesert Loam (Shadscale)
- Rock outcrop (Salt Wash Conglomerate Member of Morrison Formation)
- Badland with no vegetation

Description of the Beclabito Soil

Taxonomic classification: Fine, mixed, superactive, mesic Haplic Ustic Natrargids (fig. 57)
Landform: Hillslopes (fig. 58)
Geology: Colluvial deposits (Quaternary)
Parent material: Alluvium derived from igneous rock and/or residuum weathered from sedimentary rock
Slope: 10 to 40 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 3.7 (low)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Semidesert Loam (Shadscale)
Ecological site number: R035XY242UT
Present vegetation (in most areas): Galleta, shadscale, low rabbitbrush, Utah juniper, and Torrey's jointfir
Land capability classification (nonirrigated areas): 7e
Ground cover (percent): (fig. 59)
- Plant canopy 20-30

Figure 57.—Profile of the Beclabito soil in map unit 6 (Beclabito-Lybrook, saline-sodic, complex, 10 to 40 percent slopes). Scale is in centimeters.

Litter (<5 mm)	0-10
Rock fragments	50-60
Bare soil	10-20
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 478563 meters E., 4255201 meters N., zone 12

Figure 58.—The Beclabito soil on hillslopes in map unit 6 (Beclabito-Lybrook, saline-sodic, complex, 10 to 40 percent slopes). This map unit is in Cathedral Valley.

A—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/4) cobbly loam, brown (7.5YR 4/4) moist; 25 percent clay; moderate medium granular structure; slightly hard, friable, moderately sticky and moderately plastic; common fine and common very fine roots throughout; common very fine irregular pores; 20 percent gravel and 10 percent cobbles; slightly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Btkn—4 to 15.5 inches (10 to 39 centimeters); light reddish brown (5YR 6/4) clay, reddish brown (5YR 5/4) moist; 41 percent clay; moderate coarse prismatic structure parting to moderate medium angular blocky; moderately hard, firm, very sticky and very plastic; common fine and few very fine roots throughout; many very fine vesicular pores; few discontinuous distinct clay films on all faces of peds; many fine irregular carbonate masses on bottom of rock fragments and common medium irregular carbonate masses in matrix; 5 percent cobbles; strongly effervescent; strongly alkaline, pH 8.8; clear smooth boundary.

Btk—15.5 to 29.5 inches (39 to 75 centimeters); light reddish brown (5YR 6/4) cobbly clay loam, reddish brown (5YR 5/4) moist; 35 percent clay; moderate medium angular blocky structure; moderately hard, firm, very sticky and very plastic; few fine roots throughout; common very fine irregular pores; few discontinuous distinct clay films on all faces of peds; common fine irregular carbonate masses in matrix and many fine irregular carbonate masses on bottom of rock fragments; 10 percent gravel and 20 percent cobbles; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

2R—29.5 to 39.5 inches (75 to 100 centimeters); indurated sandstone.

Range in Characteristics

Note: Some pedons have a paralithic contact instead of a lithic contact

A horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—loam, clay loam, or sandy clay loam
Clay content—25 to 35 percent
Calcium carbonate equivalent—1 to 3 percent
Gypsum content—0 to 2 percent
SAR—0 to 5
Rock fragments—15 to 50 percent gravel and cobbles

Btkn horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—silty clay loam or clay
Clay content—35 to 45 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—0 to 2 percent
SAR—10 to 20
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—5 to 15 percent gravel and cobbles

Btk horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Texture—clay loam or silty clay loam

Figure 59.—Typical surface of the Beclabito soil in map unit 6 (Beclabito-Lybrook, saline-sodic, complex, 10 to 40 percent slopes).

Figure 60.—Profile of the Lybrook, saline-sodic soil in map unit 6 (Beclabito-Lybrook, saline-sodic, complex, 10 to 40 percent slopes). Scale is in centimeters.

Clay content—30 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—0 to 2 percent
SAR—0 to 5
Electrical conductivity—2 to 4 mmhos/cm
Rock fragments—5 to 35 percent gravel and cobbles

This Beclabito soil is mapped as a taxadjunct to the Beclabito series because it is moderately deep to a lithic contact and has a fine particle-size class with more than 35 percent clay in the particle-size control section. The Beclabito series is more than 100 centimeters deep to bedrock and has a fine-loamy particle-size class with less than 35 percent clay in the particle-size control section.

Description of the Lybrook, Saline-Sodic Soil

Taxonomic classification: Fine, mixed, superactive, calcareous, mesic Ustic Torriorthents (fig. 60)
Landform: Hillslopes (fig. 61)

Geology: Morrison Formation (Jurassic), Brushy Basin Member
Parent material: Residuum weathered from sedimentary rock
Slope: 20 to 40 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 2.5 (very low)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Semidesert Shallow Clay (Shadscale-Utah Juniper)
Ecological site number: R035XY239UT
Present vegetation (in most areas): Galleta, Utah juniper, Douglas rabbitbrush, needle and thread, Torrey's jointfir, and shadscale
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	0-10
Rock fragments	50-60
Bare soil	10-20

Figure 61.—The Lybrook, saline-sodic soil on hillslopes in map unit 6 (Beclabito-Lybrook, saline-sodic, complex, 10 to 40 percent slopes).

Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 478885 meters E., 4255106 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); reddish brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; 41 percent clay; moderate coarse and moderate medium subangular blocky structure; hard, very firm, very sticky and very plastic; common very fine roots throughout; common very fine irregular pores; 5 percent gravel; slightly effervescent; strongly alkaline, pH 8.8; clear smooth boundary.

AC—4 to 9 inches (10 to 23 centimeters); reddish brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; 42 percent clay; weak medium angular blocky structure; hard, very firm, very sticky and very plastic; common very fine roots throughout; common very fine irregular pores; slightly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Cy—9 to 28.5 inches (23 to 73 centimeters); 40 percent reddish brown (2.5YR 5/3) and 60 percent white (2.5Y 8/1) silty clay, 40 percent reddish brown (2.5YR 4/3) and 60 percent light gray (2.5Y 7/1) moist; 50 percent clay; massive; very hard, extremely firm, very sticky and very plastic; few fine roots throughout; common very fine irregular pores; many fine irregular gypsum crystals in matrix; very slightly effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

C—28.5 to 37.5 inches (73 to 95 centimeters); reddish brown (2.5YR 5/3) extremely paragravelly silty clay, reddish brown (2.5YR 4/3) moist; 42 percent clay; massive; hard, very firm, very sticky and very plastic; few fine roots throughout; common very fine irregular pores; 70 percent gravel; very slightly effervescent; strongly alkaline, pH 9.0; clear smooth boundary.

Cr—37.5 to 47 inches (95 to 120 centimeters); moderately cemented siltstone.

Range in Characteristics

A horizon:

Hue—10R, 5YR, or 7.5YR
Chroma—3 or 4, dry or moist
Texture—silty clay loam, sandy clay, or silty clay
Clay content—30 to 45 percent
Calcium carbonate equivalent—3 to 10 percent
Gypsum content—0 to 2 percent
SAR—10 to 20
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 15 percent gravel

AC horizon:

Clay content—40 to 45 percent
Calcium carbonate equivalent—3 to 10 percent
Gypsum content—0 to 2 percent
SAR—10 to 20
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 5 percent gravel

Cy and C horizons:

Hue—2.5YR, 5YR, 7.5YR, 10YR, or 2.5Y
Value—5 to 8 dry; 4 to 7 moist

Chroma—1 to 3, dry or moist
Clay content—40 to 50 percent
Calcium carbonate equivalent—1 to 3 percent
Gypsum content—0 to 15 percent
SAR—10 to 20
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 70 percent paragravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Lybrook soil differs from the Lybrook series in that it has slopes of 20 to 40 percent, has hue as red as 2.5YR, and is moderately deep or deep to a paralithic contact. The Lybrook series has slopes of 0 to 5 percent, has hue of 10YR or yellower throughout, and is more than 150 centimeters deep to bedrock.

7—Begay fine sandy loam, 1 to 15 percent slopes, moist

Map Unit Setting

General setting: Areas south of Oak Creek
Major land resource area: 35—Colorado Plateau
Elevation: 5,700 to 5,890 feet (1,736 to 1,795 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Begay, moist and similar soils: 80 percent
Minor components (20 percent) and their ecological sites:
Very deep, clayey soils with accumulated sodium and other salts on alluvial flats; Alkali Bottom (Greasewood)
Very deep, loamy-skeletal soils with calcic horizons on pediments; Semidesert Loam (Shadscale)

Description of the Begay, Moist Soil

Note: This soil is assigned a moist phase because it supports Wyoming big sagebrush whereas Begay soils more commonly support a grass and fourwing saltbush plant community.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 62)
Landform: Alluvial flats (fig. 63)
Geology: Alluvium and dune sand (Quaternary)
Parent material: Slope alluvium derived from sandstone and shale and/or eolian sands derived from sandstone
Slope: 1 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 10.8 (very high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low

Figure 62.—Profile of the Begay, moist soil in map unit 7 (Begay fine sandy loam, 1 to 15 percent slopes, moist). Scale is in centimeters .

Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY216UT
Present vegetation (in most areas): Utah juniper, Wyoming big sagebrush, twoneedle pinyon, and Wright's bird's beak
Land capability classification (nonirrigated areas): 7e

Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-20
Rock fragments	0
Bare soil	20-30
Cyanobacteria crust	20-30
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 488841 meters E., 4213344 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); reddish yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 4/6) moist; 8 percent clay; weak very thick platy structure; slightly hard, very friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine irregular pores; very slightly effervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

Bw—3.5 to 19 inches (9 to 48 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 11 percent clay; weak coarse subangular blocky structure; moderately hard, friable, slightly sticky and slightly plastic; few very fine, few fine, and few medium roots throughout; common very fine and common fine irregular pores; very slightly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Bk—19 to 77 inches (48 to 196 centimeters); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6) moist; 9 percent clay; weak medium subangular

Figure 63.—The Begay, moist soil on alluvial flats in map unit 7 (Begay fine sandy loam, 1 to 15 percent slopes, moist). This map unit is near Oak Creek.

blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine, few medium, and few coarse roots throughout; common very fine and common fine irregular pores; few medium irregular carbonate masses in matrix; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:
Hue—5YR or 7.5YR
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or very fine sandy loam
Clay content—8 to 12 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 5 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw horizon:
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 5 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bk horizon:
Value—5 or 6 dry; 4 or 5 moist
Clay content—8 to 12 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 5 percent gravel

8—Begay sandy loam, 1 to 9 percent slopes

Map Unit Setting

General setting: Strike Valley
Major land resource area: 35—Colorado Plateau
Elevation: 5,240 to 5,740 feet (1,597 to 1,750 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Begay and similar soils: 90 percent
Minor components (10 percent) and their ecological sites:
Begay, moist soils on stream terraces (very deep, coarse-loamy soils); Semidesert Loam (Wyoming Big Sagebrush)
Very deep, fine-loamy soils with argillic horizons on toeslopes of alluvial fans; Semidesert Sandy Loam (Fourwing Saltbush)
Querencia, saline-sodic soils on alluvial fans (very deep, fine-loamy soils); Desert Loam (Shadscale)

Description of the Begay Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 64)
Landform: Alluvial fans (fig. 65)

Figure 64.—Profile of the Begay soil in map unit 8 (Begay sandy loam, 1 to 9 percent slopes). Scale is in centimeters.

Geology: Alluvial deposits (Quaternary)
Parent material: Alluvium derived from sandstone and/or slope alluvium derived from sandstone
Slope: 1 to 9 percent, northeast to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 9.8 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent

Figure 65.—Landscape the Begay soil in map unit 8 (Begay sandy loam, 1 to 9 percent slopes) on alluvial fans in Strike Valley.

Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): Galleta, Indian ricegrass, fourwing saltbush, plains pricklypear, and prairie sunflower
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	40-55
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 494454 meters E., 4200482 meters N., zone 12

Ak—0 to 5.5 inches (0 to 14 centimeters); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; 16 percent clay; moderate thick platy structure; moderately hard, friable, slightly sticky and nonplastic; few fine and few very fine roots between peds; common very fine and common fine irregular pores; few very fine spherical carbonate masses in matrix; 3 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk1—5.5 to 31.5 inches (14 to 80 centimeters); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; 18 percent clay; weak medium subangular blocky structure; moderately hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; many very fine and common fine irregular pores; few irregular carbonate masses on bottom of rock fragments and few very fine spherical carbonate masses in matrix; 3 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

Bk2—31.5 to 77.5 inches (80 to 197 centimeters); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; 17 percent clay; weak medium subangular blocky structure; moderately hard, friable, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; few very fine spherical carbonate masses in matrix; 4 percent gravel; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Ak horizon:

Hue—5YR or 7.5YR
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—0 to 5 percent gravel

Bw or Bk horizons:

Hue—5YR or 7.5YR
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 5 percent gravel

9—Begay very fine sandy loam, 1 to 5 percent slopes, moist

Map Unit Setting

General setting: South Draw, south of Pleasant Creek
Major land resource area: 35—Colorado Plateau
Elevation: 5,880 to 6,280 feet (1,791 to 1,915 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Begay, moist and similar soils: 80 percent
Minor components (20 percent) and their ecological sites:

Pherson family soils on stream terraces (very deep, loamy-skeletal, stratified soils); Loamy Bottom (Basin Big Sagebrush)
Moderately deep, coarse-loamy soils with argillic horizons on hills; Semidesert Gravelly Loam (Utah Juniper-Pinyon)
Deep, fine-loamy soils on hills; Semidesert Gravelly Loam (Utah Juniper-Pinyon)
Riverwash in channels with no vegetation

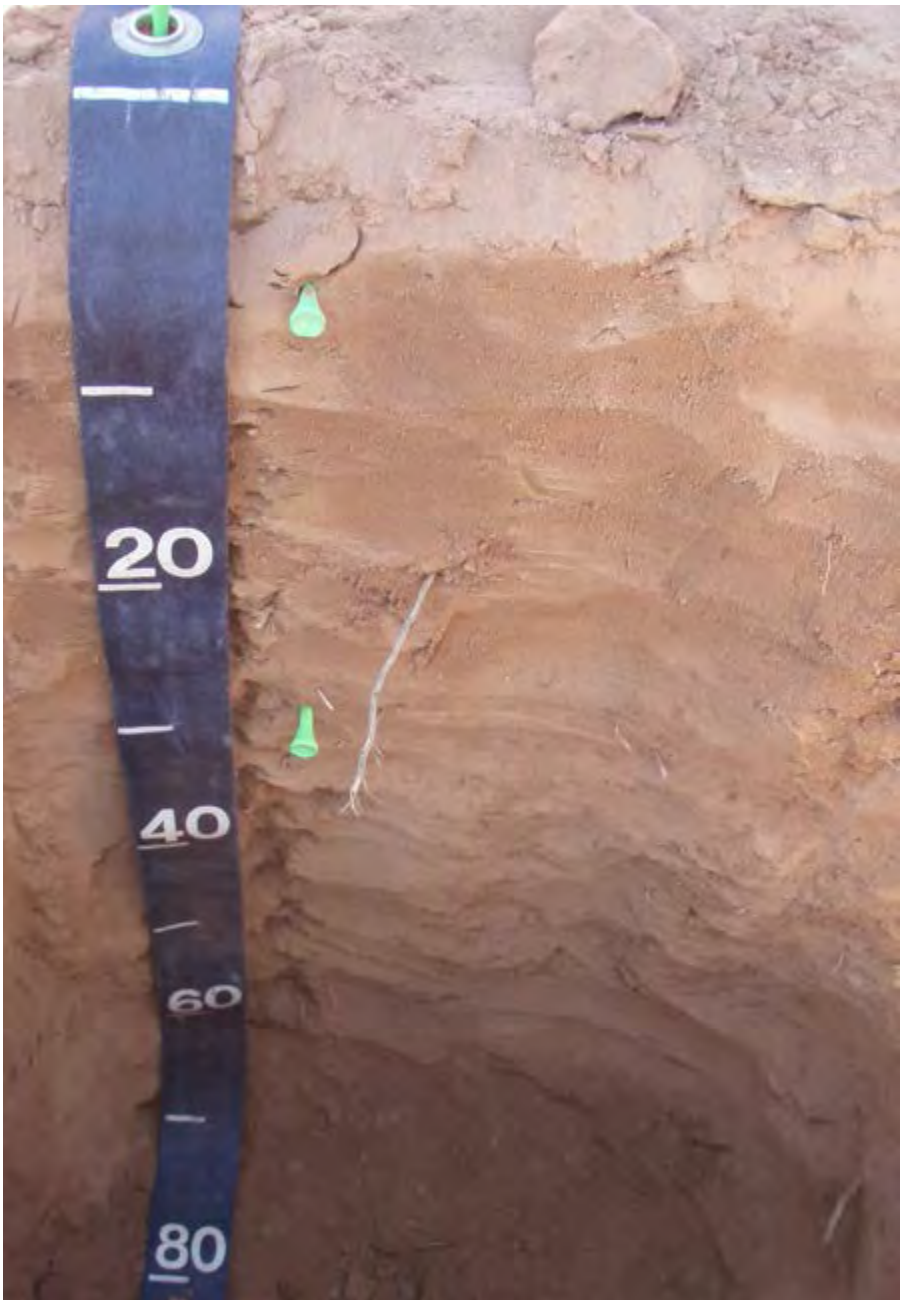

Figure 66.—Profile of the Begay, moist soil in map unit 9 (Begay very fine sandy loam, 1 to 5 percent slopes, moist). Scale is in centimeters.

Description of the Begay, Moist Soil

Note: A moist phase is assigned to this soil to account for the sagebrush ecological site.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 66)
Landform: Intermediate and high stream terraces (fig. 67)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone

Slope: 1 to 5 percent, northeast to north aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 10.4 (very high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Very rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY216UT
Present vegetation (in most areas): Wyoming big sagebrush, fourwing saltbush, broom snakeweed, Indian ricegrass, needle and thread, and plains pricklypear
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	30-45
Litter (<5 mm)	5-20
Rock fragments	0-5
Bare soil	30-45
Cyanobacteria crust	0
Lichen crust	0

Figure 67.—Landscape of the Begay, moist soil in map unit 9 (Begay very fine sandy loam, 1 to 5 percent slopes, moist). This soil occurs on stream terraces. Vegetation is basin big sagebrush.

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 484420 meters E., 4224833 meters N., zone 12

A—0 to 2.5 inches (0 to 6 centimeters); yellowish red (5YR 4/6) very fine sandy loam, dark red (2.5YR 3/6) moist; 12 percent clay; weak medium platy structure; soft, very friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bw1—2.5 to 11 inches (6 to 28 centimeters); red (2.5YR 4/6) very fine sandy loam, dark red (2.5YR 3/6) moist; 14 percent clay; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine, few fine, and few medium roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bw2—11 to 33.5 inches (28 to 85 centimeters); yellowish red (5YR 4/6) very fine sandy loam, dark reddish brown (5YR 3/4) moist; 13 percent clay; weak coarse and weak medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; few very fine, few fine, and few medium roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Ck1—33.5 to 51 inches (85 to 130 centimeters); yellowish red (5YR 4/6) very fine sandy loam, dark red (2.5YR 3/6) moist; 14 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; few fine roots throughout; many very fine irregular pores; few fine irregular carbonate masses in matrix; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Ck2—51 to 67 inches (130 to 170 centimeters); reddish brown (2.5YR 4/4) loamy fine sand, dark reddish brown (2.5YR 3/4) moist; 8 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine roots throughout; many very fine irregular pores; few fine irregular carbonate masses in matrix; slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Ck3—67 to 73 inches (170 to 185 centimeters); reddish brown (2.5YR 4/4) fine sandy loam, dark reddish brown (2.5YR 3/4) moist; 13 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine irregular carbonate masses in matrix; 5 percent gravel; slightly effervescent; slightly alkaline, pH 7.8.

Range in Characteristics

A horizon:

Hue—5YR or 2.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loamy fine sand
Clay content—8 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw or Bk horizons:

Hue—5YR or 2.5YR
Value—4 to 6 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist

Texture—fine sandy loam, very fine sandy loam, silt loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel

C or Ck horizons:
Hue—5YR or 2.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loamy fine sand
Clay content—8 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

10—Begay, saline-Querencia, saline-sodic complex, 1 to 9 percent slopes

Map Unit Setting

General setting: Strike Valley (fig. 68)
Major land resource area: 35—Colorado Plateau
Elevation: 4,850 to 5,740 feet (1,477 to 1,751 meters)

Figure 68.—Landscape of map unit 10 (Begay, saline-Querencia, saline-sodic complex, 1 to 9 percent slopes). This map unit is on alluvial fans in Strike Valley.

Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Begay, saline and similar soils: 50 percent
Querencia, saline-sodic and similar soils: 35 percent
Minor components (15 percent) and their ecological sites:
- Moderately deep, fine-silty soils on low hills; Desert Loam (Shadscale)
- Begay, moist soils on stream terraces (very deep, coarse-loamy soils); Loamy Bottom (Basin Big Sagebrush)
- Gullies with no vegetation

Description of the Begay, Saline Soil

Note: A saline phase and a desert ecological site are assigned to this ustic aridic soil because the high electrical conductivity of the soil reduces the amount of water available for uptake by plant roots.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 69)
Landform: Alluvial fans
Geology: Alluvial deposits (Quaternary)
Parent material: Alluvium derived from sandstone and/or slope alluvium derived from sandstone
Slope: 2 to 9 percent, northeast to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 10.2 (very high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Loam (Shadscale)
Ecological site number: R035XY242UT
Present vegetation (in most areas): Shadscale, galleta, Indian ricegrass, and winterfat
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-20
Rock fragments	0-15
Bare soil	45-65
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 69.—Profile of the Begay, saline soil in map unit 10 (Begay, saline-Querencia, saline-sodic complex, 1 to 9 percent slopes). Scale is in centimeters.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 495584 meters E., 4198861 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; 11 percent clay; moderate medium platy structure; soft, very friable, slightly sticky and nonplastic; common very fine roots throughout; many very fine vesicular pores; 1 percent channers; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk—3.5 to 11 inches (9 to 28 centimeters); light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; 16 percent clay; weak very coarse prismatic structure parting to weak thick platy; hard, very firm, slightly sticky and

nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; few very fine spherical carbonate masses in matrix; 1 percent channers; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw—11 to 27 inches (28 to 68 centimeters); light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; 15 percent clay; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 1 percent channers; slightly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C—27 to 47.5 inches (68 to 121 centimeters); light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; 12 percent clay; massive; slightly hard, firm, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; 1 percent channers; strongly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

Cz—47.5 to 73 inches (121 to 185 centimeters); light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; 12 percent clay; massive; slightly hard, firm, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; common very fine irregular salt masses in matrix; 3 percent channers; strongly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon:

Value—4 to 6, dry or moist
Chroma—3 or 4, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—8 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

BA and Bw horizons:

Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 8 mmhos/cm
Rock fragments—0 to 5 percent gravel

C horizon:

Texture—sandy loam or fine sandy loam
Clay content—8 to 15 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 8 mmhos/cm
Rock fragments—0 to 5 percent gravel

Cz horizon:

Texture—sandy loam or fine sandy loam
Clay content—8 to 15 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 5 percent gravel

This Begay soil differs from the Begay series in that it has hue of 2.5Y throughout and electrical conductivities up to 16 mmhos/cm. The Begay series has hue of 7.5YR and redder in all subsurface horizons and lower electrical conductivities.

Figure 70.—Profile of the Querencia, saline-sodic soil in map unit 10 (Begay, saline-Querencia, saline-sodic complex, 1 to 9 percent slopes). Scale is in centimeters.

Description of the Querencia, Saline-Sodic Soil

Note: A saline-sodic phase and a desert ecological site are assigned to this ustic aridic soil because the high electrical conductivity of the soil reduces the amount of water available for uptake by plant roots.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 70)
Landform: Alluvial fans
Geology: Alluvial deposits (Quaternary)
Parent material: Alluvium derived from sandstone and shale and/or slope alluvium derived from sandstone and shale
Slope: 1 to 9 percent, northeast to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained

Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 11.0 (very high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Semidesert Loam (Shadscale)
Ecological site number: R035XY242UT
Present vegetation (in most areas): Shadscale, galleta, Indian ricegrass, and winterfat
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-20
Rock fragments	0-15
Bare soil	45-65
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 496437 meters E., 4196206 meters N., zone 12

A—0 to 2.5 inches (0 to 6 centimeters); light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; 11 percent clay; moderate very thick platy structure parting to moderate thin platy; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; many fine vesicular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bwn—2.5 to 6.5 inches (6 to 16 centimeters); light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; 20 percent clay; weak very coarse prismatic structure parting to weak very thick platy; slightly hard, friable, moderately sticky and nonplastic; common very fine roots throughout; slightly effervescent; strongly alkaline, pH 9.0; clear wavy boundary.

Bw—6.5 to 17 inches (16 to 43 centimeters); light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; 11 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; 1 percent gravel; slightly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bkn—17 to 27.5 inches (43 to 70 centimeters); light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; 19 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; 3 percent gravel; slightly effervescent; strongly alkaline, pH 8.8; clear wavy boundary.

Bk—27.5 to 39.5 inches (70 to 100 centimeters); light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; 18 percent clay; moderate medium subangular blocky structure; hard, firm, moderately sticky and nonplastic; common fine roots

throughout; 5 percent gravel; slightly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

Cz—39.5 to 71 inches (100 to 180 centimeters); light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; 11 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots throughout; few very fine irregular salt masses in matrix; 3 percent gravel; slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon:

Hue—2.5Y or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 5 percent gravel

Bw horizons:

Hue—2.5Y or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Clay content—18 to 27 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bk horizons:

Hue—2.5Y or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Clay content—18 to 27 percent
Calcium carbonate equivalent—5 to 10 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C horizon:

Hue—2.5Y or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 10 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Figure 71.—Profile of the Begay, saline-sodic soil in map unit 11 (Begay, saline-sodic-Begay, moist-Elias complex, 2 to 8 percent slopes). Scale is in centimeters.

11—Begay, saline-sodic-Begay, moist-Elias complex, 2 to 8 percent slopes

Map Unit Setting

General setting: Upper Cathedral Valley
Major land resource area: 35—Colorado Plateau
Elevation: 5,950 to 6,710 feet (1,813 to 2,046 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Begay, saline-sodic and similar soils: 50 percent
Begay, moist and similar soils: 25 percent
Elias and similar soils: 20 percent
Minor components (5 percent) and their ecological sites:
- Riverwash in channels with no vegetation
- Moderately deep, fine-loamy soils on hills; Semidesert Shallow Loam (Utah Juniper-Pinyon)
- Badland with no vegetation

Description of the Begay, Saline-Sodic Soil

Note: A saline-sodic phase is assigned to this soil to account for the greasewood ecological site.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 71)

Landform: Stream terraces (fig. 72)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone and siltstone
Slope: 2 to 8 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 9.0 (high)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: B
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Alkali Flat (Greasewood)
Ecological site number: R035XY009UT
Present vegetation (in most areas): Indian ricegrass, alkali sacaton, blue grama, greasewood, and fourwing saltbush
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	20-30
Rock fragments	0-5

Figure 72.—Landscape of the Begay, saline-sodic soil in map unit 11 (Begay, saline-sodic-Begay, moist-Elias complex, 2 to 8 percent slopes) in Cathedral Valley.

Bare soil	35-50
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 469229 meters E., 4260082 meters N., zone 12

A—0 to 4.5 inches (0 to 12 centimeters); brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; 15 percent clay; weak very thick platy structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; common very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw1—4.5 to 10 inches (12 to 26 centimeters); brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; 16 percent clay; moderate thick platy and moderate coarse subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; few fine roots throughout; common very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw2—10 to 37.5 inches (26 to 95 centimeters); brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; 17 percent clay; moderate coarse subangular blocky structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and nonplastic; few fine roots throughout; common very fine irregular pores; violently effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

Bnz1—37.5 to 61 inches (95 to 155 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 25 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots throughout; common very fine irregular pores; common medium irregular salt masses throughout; strongly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Bnz2—61 to 71 inches (155 to 180 centimeters); brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; 23 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots throughout; common very fine irregular pores; common fine irregular salt masses throughout; strongly effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

A horizon:

Hue—5YR or 7.5YR
Value—3 to 5, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Bw horizon:

Hue—5YR or 7.5YR
Value—3 to 5, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loam

Clay content—15 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—0 to 5
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bnz horizon:
Hue—5YR or 7.5YR
Value—3 to 5, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loam
Clay content—15 to 27 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—0 to 5
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Begay, Moist Soil

Note: A moist phase is assigned to this soil to account for the sagebrush ecological site.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 73)
Landform: Stream terraces (fig.74)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone and siltstone
Slope: 2 to 8 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 10.0 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Sandy Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY216UT
Present vegetation (in most areas): Wyoming big sagebrush, fourwing saltbush, blue grama, Indian ricegrass, and rubber rabbitbrush
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	30-40
Rock fragments	0-5
Bare soil	30-40
Cyanobacteria crust	0-5
Lichen crust	0

Figure 73.—Profile of the Begay, moist soil in map unit 11 (Begay, saline-sodic-Begay, moist-Elias complex, 2 to 8 percent slopes). Scale is in centimeters.

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 469317 meters E., 4259855 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/3) moist; 17 percent clay; weak thick platy structure; moderately hard, friable, slightly sticky and nonplastic; few fine and few medium roots throughout; few medium irregular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bw1—4 to 14 inches (10 to 35 centimeters); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; 15 percent clay; moderate thick platy structure parting to weak coarse subangular blocky; moderately hard, friable, slightly sticky and nonplastic; few fine and few medium roots throughout; few medium irregular pores; 2 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw2—14 to 32.5 inches (35 to 82 centimeters); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; 16 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and few medium roots throughout; few medium irregular pores; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bz1—32.5 to 55 inches (82 to 140 centimeters); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; 17 percent clay; weak medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; few fine roots throughout; common very fine irregular pores; common fine irregular salt masses throughout; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bz2—55 to 71 inches (140 to 180 centimeters); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; 17 percent clay; weak medium subangular blocky structure; moderately hard, friable, slightly sticky and

Figure 74.—Landscape of the Begay, moist soil in map unit 11 (Begay, saline-sodic-Begay, moist-Elias complex, 2 to 8 percent slopes) in Cathedral Valley.

nonplastic; few fine roots throughout; common very fine irregular pores; common fine irregular salt masses throughout; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content in particle-size control section: Average of less than 18 percent

A horizon:
Hue—5YR or 7.5YR
Value—3 to 5, dry or moist
Chroma—3 or 4, dry or moist
Texture—very fine sandy loam or loam
Clay content—15 to 18 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Bw horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 3 to 5 moist
Texture—fine sandy loam
Clay content—15 to 20 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—0 to 5
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bz horizon:
Hue—5YR or 7.5YR
Value—3 to 5, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loam
Clay content—15 to 27 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—0 to 5
Electrical conductivity—4 to 16 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Elias Soil

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Natrargids (fig. 75)
Landform: Stream terraces (fig. 76)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone and siltstone
Slope: 2 to 8 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 12.7 (very high)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches

Figure 75.—Profile of the Elias soil in map unit 11 (Begay, saline-sodic-Begay, moist-Elias complex, 2 to 8 percent slopes). The natric horizon begins at a depth of about 14 centimeters. Scale is in centimeters.

Runoff class: Medium
Hydrologic group: C
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Alkali Flat (Greasewood)

Figure 76.—Landscape of the Elias soil in map unit 11 (Begay, saline-sodic-Begay, moist-Elias complex, 2 to 8 percent slopes) showing areas of surface soil loss above the natric horizon. This map unit is in Cathedral Valley.

Ecological site number: R035XY009UT
Present vegetation (in most areas): Greasewood, alkali sacaton, fourwing saltbush, blue grama, and Indian ricegrass
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	20-25
Rock fragments	0-2
Bare soil	40-45
Cyanobacteria crust	0-2
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 469151 meters E., 4259717 meters N., zone 12

A—0 to 5.5 inches (0 to 14 centimeters); yellowish red (5YR 5/6) very fine sandy loam, reddish brown (5YR 5/4) moist; 17 percent clay; weak thick platy structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Btn—5.5 to 13 inches (14 to 33 centimeters); yellowish red (5YR 5/6) clay loam, yellowish red (5YR 4/6) moist; 34 percent clay; moderate coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, slightly rigid, moderately sticky and moderately plastic; common very fine roots throughout; many very fine vesicular pores; common discontinuous distinct clay films on all faces of peds; strongly effervescent; very strongly alkaline, pH 9.2; abrupt smooth boundary.

Bn—13 to 33.5 inches (33 to 85 centimeters); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; 26 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and slightly plastic; few very fine roots throughout; many very fine interstitial pores; slightly effervescent; strongly alkaline, pH 9.0; clear smooth boundary.

Bnz1—33.5 to 59 inches (85 to 150 centimeters); yellowish red (5YR 5/6) clay loam, yellowish red (5YR 4/6) moist; 28 percent clay; weak medium angular blocky structure; moderately hard, firm, moderately sticky and slightly plastic; few very fine roots throughout; common very fine irregular pores; common fine irregular salt masses in matrix; slightly effervescent; strongly alkaline, pH 9.0; clear smooth boundary.

Bnz2—59 to 71 inches (150 to 180 centimeters); yellowish red (5YR 5/6) clay, reddish brown (5YR 4/4) moist; 42 percent clay; weak medium subangular blocky structure; hard, very firm, very sticky and very plastic; few very fine roots throughout; common very fine irregular pores; common fine irregular salt masses in matrix; slightly effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

A horizon:

Clay content—15 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

Btn horizon:

Clay content—28 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—10 to 20
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—none

Bn horizon:

Clay content—20 to 27 percent
Calcium carbonate equivalent—1 to 3 percent
SAR—10 to 20
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—none

Bnz horizon:

Texture—clay loam or clay
Clay content—27 to 45 percent
Calcium carbonate equivalent—1 to 3 percent
SAR—10 to 20
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—none

This Elias soil differs from the Elias series in that it has hue of 5YR and electrical conductivities up to 16 mmhos/cm in the subsurface horizons. The Elias series has hue ranging from 2.5Y to 10YR and is slightly saline (up to 8 mmhos/cm).

12—Begay-Ignacio-Retsabal complex, 2 to 60 percent slopes

Map Unit Setting

General setting: The Waterpocket Fold between Sheets Gulch and Bitter Creek Divide
Major land resource area: 35—Colorado Plateau
Elevation: 5,520 to 6,100 feet (1,683 to 1,860 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Begay and similar soils: 40 percent
Ignacio and similar soils: 25 percent
Retsabal and similar soils: 15 percent
Minor components (20 percent) and their ecological sites:
- Rock outcrop (Entrada Sandstone, Carmel Formation sandstone and arenaceous limestone)
- Rizno soils on homclinal ridges (shallow, loamy soils); Semidesert Shallow Loam (Utah Juniper-Pinyon)

Description of the Begay Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 77)
Landform: Dissected pediments and cuestas (fig. 78)
Geology: Quaternary alluvial and eolian deposits
Parent material: Eolian deposits derived from sandstone over slope alluvium derived from sandstone
Slope: 2 to 20 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 10.7 (very high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): Indian ricegrass, sandhill muhly, crispleaf buckwheat, fourwing saltbush, and lupine
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	5-15
Rock fragments	0-5
Bare soil	45-60

Figure 77.—Profile of the Begay soil in map unit 12 (Begay-Ignacio-Retsabal complex, 2 to 60 percent slopes). Scale is in centimeters.

Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 493451 meters E., 4202857 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); light brown (7.5YR 6/4) very fine sandy loam, strong brown (7.5YR 4/6) moist; 9 percent clay; weak very thick platy structure; soft, very friable, slightly sticky and nonplastic; few very fine roots throughout; common medium tubular, many very fine irregular, and common fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw1—3.5 to 9.5 inches (9 to 24 centimeters); light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; 11 percent clay; weak medium subangular

Figure 78.—The Begay soil in map unit 12 (Begay-Ignacio-Retsabal complex, 2 to 60 percent slopes) on dissected cuestas and pediments.

blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw2—9.5 to 20 inches (24 to 51 centimeters); reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 5/4) moist; 10 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

C1—20 to 51 inches (51 to 130 centimeters); reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 5/4) moist; 8 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; many very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

C2—51 to 75.5 inches (130 to 192 centimeters); reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 4/4) moist; 9 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common fine and few very fine roots throughout; many very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Hue—7.5YR or 10YR
Value—5 or 6 dry
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loamy fine sand

Clay content—5 to 10 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw or Bk horizons:
Hue—7.5YR or 5YR
Value—5 to 7 dry
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or loam
Clay content—7 to 15 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C horizons:
Hue—7.5YR or 5YR
Value—4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or loamy fine sand
Clay content—5 to 12 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Ignacio Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 79)
Landform: Dissected pediments and cuestas (fig. 80)
Geology: Entrada and Carmel Formations (Jurassic)
Parent material: Slope alluvium derived from sandstone over residuum weathered from sandstone
Slope: 20 to 60 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 2.1 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: B
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, twoneedle pinyon, blue grama, galleta, Indian ricegrass, and green ephedra

Figure 79.—Profile of the Ignacio soil in map unit 12 (Begay-Ignacio-Retsabal complex, 2 to 60 percent slopes). Bedrock is at a depth of 68 centimeters. Scale is in centimeters.

Land capability classification (nonirrigated areas): 7e

Ground cover (percent):

Plant canopy	20-35
Litter (<5 mm)	5-15
Rock fragments	0-5
Bare soil	50-60
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 489368 meters E., 4214427 meters N., zone 12

Ak—0 to 3 inches (0 to 7 centimeters); pink (5YR 7/4) sandy loam, reddish brown (5YR 5/4) moist; 10 percent clay; weak very thick platy structure; friable, nonsticky and nonplastic; few very fine roots throughout; many very fine interstitial, many very fine irregular, and common fine irregular pores; common fine irregular carbonate masses in matrix; 3 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bky1—3 to 12 inches (7 to 31 centimeters); pink (5YR 7/4) very paragravelly sandy loam, yellowish red (5YR 4/6) moist; 11 percent clay; weak fine subangular blocky structure; very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; common medium, many very fine, and many fine irregular pores; common fine irregular carbonate masses in matrix, common fine dendritic carbonate masses in matrix, and few fine irregular gypsum crystals in matrix; 55 percent paragravel; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bky2—12 to 21 inches (31 to 53 centimeters); reddish yellow (5YR 6/6) very paragravelly sandy loam, yellowish red (5YR 4/6) moist; 13 percent clay; weak medium subangular blocky structure; friable, slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine and many fine irregular pores; few fine irregular gypsum crystals in matrix, common fine irregular carbonate masses in matrix, and common fine dendritic carbonate masses in matrix; 55 percent paragravel; strongly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Figure 80.—The Ignacio soil in map unit 12 (Begay-Ignacio-Retsabal complex, 2 to 60 percent slopes) on dissected cuestas and pediments.

Cy—21 to 27 inches (53 to 68 centimeters); reddish yellow (5YR 6/6) very paragravelly loam, yellowish red (5YR 4/6) moist; 18 percent clay; weak fine subangular blocky structure; firm, slightly sticky and slightly plastic; common very fine roots throughout; common very fine and common fine irregular pores; finely disseminated carbonate and common fine irregular gypsum crystals in matrix; 50 percent paragravel; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

R—27 to 36.5 inches (68 to 93 centimeters); fractured, strongly cemented interbedded sandstone and shale.

Range in Characteristics

Clay content in the particle-size control section: Average of less than 18 percent

A or Ak horizon:
Hue—7.5YR or 5YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—3 or 4 dry; 4 or 6 moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel

Bk or Bky horizons:
Hue—5YR, 7.5YR, or 10YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—3 to 6 dry; 4 or 6 moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—7 to 20 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—0 to 5
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 60 percent paragravel
Reaction—slightly alkaline or moderatly alkaline (pH 7.4 to 8.4)

C or Cy horizons:
Hue—5YR, 7.5YR, 10YR, or 2.5Y
Value—6 to 8 dry; 4 to 7 moist
Chroma—2 to 6, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, loam, or loamy sand
Clay content—5 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—0 to 5
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—10 to 70 percent paragravel
Reaction—slightly alkaline to strongly alkaline (pH 7.4 to 9.0)

This Igancio soil differs from the Ignacio series in that it occurs on slopes ranging to 60 percent and has up to 70 percent paragravel in the C horizon. The Ignacio series occurs on slopes ranging to 15 percent and has up to 15 percent rock fragments.

Description of the Retsabal Soil

Taxonomic classification: Loamy-skeletal, gypsic, mesic Lithic Haplogypsids (fig. 81)
Landform: Dissected pediments and cuestas (fig. 82)
Geology: Carmel Formation (Jurassic)
Parent material: Residuum weathered from rock gypsum

Figure 81.—Profile of the Retsabal soil in map unit 12 (Begay-Ignacio-Retsabal complex, 2 to 60 percent slopes). Gypsum bedrock is at a depth fo 17 centimeters. Scale is in centimeters.

Slope: 6 to 30 percent, northeast to west aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.5 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Gypsum (Mormontea)
Ecological site number: R035XY237UT
Present vegetation (in most areas): Torrey's jointfir, Utah juniper, galleta, crispleaf buckwheat, and green ephedra
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	15-25
Litter (<5 mm)	5-10
Rock fragments	5-15
Bare soil	5-10
Cyanobacteria crust	30-40

Figure 82.—Landscape of the Retsabal soil in map unit 12 (Begay-Ignacio-Retsabal complex, 2 to 60 percent slopes).

Lichen crust	0-10
Moss crust	0
Salt crust	0
Gypsum crust	0-10

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 489391 meters E., 4215101 meters N., zone 12

Aky—0 to 2.5 inches (0 to 6 centimeters); pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; 11 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine and common fine irregular pores; few fine irregular carbonate masses in matrix and common fine irregular gypsum crystals in matrix; 6 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Cy—2.5 to 6.5 inches (6 to 17 centimeters); light gray (10YR 7/2) extremely gravelly sandy loam, brown (10YR 5/3) moist; 12 percent clay; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few very fine, few fine, and few medium roots throughout; common very fine vesicular, common very fine irregular, and common fine irregular pores; many coarse platy gypsum crystals in matrix; 60 percent gravel and 10 percent cobbles; strongly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

R—6.5 to 16.5 inches (17 to 42 centimeters); strongly cemented interbedded sandstone, shale, and gypsum.

Range in Characteristics

A horizon:
Hue—5YR to 2.5Y
Value—6 to 8 dry; 4 to 7 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—sandy loam, fine sandy loam, or loamy sand
Clay content—3 to 12 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—5 to 15 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Cy horizon:
Hue—5YR to 2.5Y
Value—6 to 8 dry; 5 to 7 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—sandy loam, fine sandy loam, loamy sand, or loamy fine sand
Clay content—3 to 12 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—5 to 20 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 60 percent gravel, channers, or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Retsabal soil is mapped as a taxadjunct to the Retsabal series because it has a lithic contact within a depth of 50 centimeters and has a loamy-skeletal particle-size class and gypsic mineralogy. The Retsabal series is shallow to a paralithic contact and has a fine-gypseous particle-size class and hypergypsic mineralogy.

13—Begay-Rizno complex, 1 to 20 percent slopes, moist

Map Unit Setting

General setting: Base of Circle Cliffs above the Flats and base of cliffs along Scenic Drive
Major land resource area: 35—Colorado Plateau
Elevation: 5,950 to 6,460 feet (1,814 to 1,970 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Begay, moist and similar soils: 65 percent
Rizno, moist and similar soils: 15 percent
Minor components (20 percent) and their ecological sites:
Moderately deep, coarse-loamy soils with calcic horizons on hills; Semidesert Shallow Loam (Utah Juniper-Pinyon)
Shallow, loamy-skeletal soils with secondary calcium carbonates on hills and structural benches; Semidesert Shallow Loam (Utah Juniper-Pinyon)
Very deep, loamy-skeletal soils on alluvial fans and washes; Semidesert Gravelly Loam (Utah Juniper-Pinyon)

Description of the Begay, Moist Soil

Note: A moist phase is assigned to this soil to account for the sagebrush ecological site.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids
Landform: Low pediments and hills
Geology: Eolian deposits (Quaternary) from Moenkopi and Chinle Formations (Triassic)
Parent material: Eolian deposits derived from sandstone over alluvium derived from sandstone
Slope: 6 to 20 percent, east to northwest aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 9.4 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY216UT
Present vegetation (in most areas): Wyoming big sagebrush, Utah juniper, galleta, twoneedle pinyon, and Wright's bird's beak
Land capability classification (nonirrigated areas): 6s
Ground cover (percent):

Plant canopy	20-40
Litter (<5 mm)	5-15
Rock fragments	0
Bare soil	15-40
Cyanobacteria crust	10-50
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 484515 meters E., 4224043 meters N., zone 12

A—0 to 2.5 inches (0 to 6 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 10 percent clay; weak fine granular structure; soft, very friable, nonsticky and slightly plastic; few very fine roots throughout; many very fine interstitial pores; 3 percent gravel and 3 percent channers; very slightly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Bw—2.5 to 10 inches (6 to 26 centimeters); yellowish red (5YR 4/6) very fine sandy loam, reddish brown (5YR 4/4) moist; 13 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and slightly plastic; common fine

and common very fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

C1—10 to 16 inches (26 to 41 centimeters); yellowish red (5YR 4/6) fine sandy loam, yellowish red (5YR 4/6) moist; 10 percent clay; massive; soft, very friable, nonsticky and slightly plastic; few very fine, few fine, and few medium roots throughout; many very fine interstitial pores; 1 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

Ck—16 to 28.5 inches (41 to 73 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 10 percent clay; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and slightly plastic; few fine and few very fine roots throughout; common very fine irregular pores; few continuous distinct carbonate coats on bottom surfaces of rock fragments; carbonate, finely disseminated throughout; 7 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C2—28.5 to 72 inches (73 to 183 centimeters); yellowish red (5YR 4/6) sandy loam, reddish brown (5YR 4/4) moist; 11 percent clay; massive; soft, very friable, nonsticky and slightly plastic; few very fine roots throughout; many very fine interstitial pores; 5 percent gravel; very slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:

Hue—5YR or 2.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loamy fine sand
Clay content—7 to 15 percent
Calcium carbonate equivalent—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw or Bk horizons:

Hue—5YR or 2.5YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C or Ck horizons:

Hue—5YR or 2.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loamy fine sand
Clay content—7 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Figure 83.—The Rizno soil in map unit 13 (Begay-Rizno complex, 1 to 20 percent slopes, moist) on pediments.

Description of the Rizno, Moist Soil

Note: A moist phase is assigned to this soil to account for the juniper-pinyon ecological site.

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Pediments and hills (fig. 83)
Geology: Moenkopi Formation (Triassic)
Parent material: Slope alluvium derived from sandstone over residuum weathered from sandstone
Slope: 1 to 10 percent, south to north aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.9 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT

Present vegetation (in most areas): Utah juniper, twoneedle pinyon, galleta, blue grama, green ephedra, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-15
Rock fragments	30-45
Bare soil	20-30
Cyanobacteria crust	0-10
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 484439 meters E., 4223921 meters N., zone 12

A—0 to 2.5 inches (0 to 6 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 14 percent clay; weak fine granular structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; 10 percent channers; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.
Bw—2.5 to 7 inches (6 to 18 centimeters); yellowish red (5YR 4/6) fine sandy loam, reddish brown (5YR 4/4) moist; 15 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.
C—7 to 15.5 inches (18 to 39 centimeters); yellowish red (5YR 4/6) channery fine sandy loam, reddish brown (5YR 4/4) moist; 15 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine and common medium roots throughout; many very fine interstitial pores; 15 percent channers; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.
R—15.5 to 25 inches (39 to 64 centimeters); indurated sandstone.

Range in Characteristics

A horizon (if it occurs):
Hue—5YR or 7.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers

Bw horizons (if it occurs):
Hue—5YR or 7.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers

C horizon:
Hue—5YR or 7.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers

14—Begay-Strych complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Cathedral Valley
Major land resource area: 35—Colorado Plateau
Elevation: 5,600 to 6,930 feet (1,708 to 2,113 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Begay and similar soils: 60 percent
Strych and similar soils: 30 percent
Minor components (10 percent) and their ecological sites:
Mido soils on dunes and sand sheets on pediments (very deep, sandy soils); Semidesert Sand (Fourwing Saltbush)

Description of the Begay Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 84)
Landform: Alluvial fans and pediments (fig. 85)
Geology: Quaternary alluvium and pediment deposits
Parent material: Alluvium derived from sandstone and/or eolian deposits derived from sandstone
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 8.6 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): Indian ricegrass, needle and thread, blue grama, fourwing saltbush, plains pricklypear, nodding buckwheat, and prickly Russian thistle

Figure 84.—Profile of the Begay soil in map unit 14 (Begay-Strych complex, 2 to 15 percent slopes). Scale is in centimeters.

Land capability classification (nonirrigated areas): 6e

Ground cover (percent):

Plant canopy	40-50
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	35-45
Cyanobacteria crust	0
Lichen crust	0

Figure 85.—The Begay soil in map unit 14 (Begay-Strych complex, 2 to 15 percent slopes) on pediments and alluvial fans. This map unit is in Cathedral Valley.

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 468868 meters E., 4258407 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; 15 percent clay; weak thick platy structure parting to weak fine subangular blocky; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 1 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bw1—4 to 9.5 inches (10 to 24 centimeters); brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; 16 percent clay; weak very thin platy structure; moderately hard, firm, slightly sticky and nonplastic; common fine roots throughout; many very fine irregular pores; 1 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bw2—9.5 to 45.5 inches (24 to 115 centimeters); brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; 16 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; common very fine irregular pores; 1 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk—45.5 to 71 inches (115 to 180 centimeters); light brown (7.5YR 6/4) very cobbly fine sandy loam, brown (7.5YR 5/4) moist; 17 percent clay; moderate medium

subangular blocky structure; slightly hard, firm, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; many medium irregular carbonate masses in matrix; 25 percent gravel, 15 percent cobbles, and 5 percent stones; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Depth to calcic horizon (if it occurs): More than 40 inches

A horizon:
Hue—5YR or 7.5YR
Chroma—5 or 6 dry; 3 or 4 moist
Texture—fine sandy loam or very fine sandy loam
Clay content—8 to 15 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Bw horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or very fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Bk horizon:
Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 or 5 moist
Texture—fine sandy loam or very fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—2 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 50 percent gravel, cobbles, and stones

Description of the Strych Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids (fig. 86)
Landform: Alluvial fans and pediments (fig. 87)
Geology: Quaternary alluvium and pediment deposits
Parent material: Eolian deposits derived from sandstone over alluvium derived from basalt
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 2.7 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 45 percent

Figure 86.—Profile of the Strych soil in map unit 14 (Begay-Strych complex, 2 to 15 percent slopes). Large coarse fragments and the calcic horizon (light-colored layer) are below a depth of 20 centimeters. Scale is in centimeters.

Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Stony Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY246UT
Present vegetation (in most areas): Utah juniper, blue grama, fourwing saltbush, Indian ricegrass, twoneedle pinyon, needle and thread, and prickly Russian thistle
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	40-50
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	35-45
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 468069 meters E., 4260121 meters N., zone 12

A—0 to 6 inches (0 to 15 centimeters); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; 9 percent clay; weak very thick platy structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; many very fine irregular pores; 3 percent gravel and 2 percent cobbles; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—6 to 15.5 inches (15 to 39 centimeters); pink (7.5YR 7/3) very stony loam, brown (7.5YR 5/4) moist; 15 percent clay; moderate medium subangular blocky structure; moderately hard, firm, very sticky and slightly plastic; few fine and few medium roots throughout; common very fine and common fine irregular pores; many coarse irregular carbonate masses in matrix and common coarse irregular carbonate masses on bottom of rock fragments; 10 percent gravel, 20 percent cobbles, and 15 percent stones; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—15.5 to 71 inches (39 to 180 centimeters); pale brown (10YR 6/3) extremely cobbly coarse sandy loam, brown (10YR 4/3) moist; 13 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and few medium roots throughout; many medium, many very fine, and many fine interstitial pores; common coarse irregular carbonate masses on bottom of rock fragments; 50 percent gravel, 30 percent cobbles, and 10 percent stones; violently effervescent; moderately alkaline, pH 8.2.

Figure 87.—The Strych soil in map unit 14 (Begay-Strych complex, 2 to 15 percent slopes) on alluvial fans and pediments in Cathedral Valley.

Range in Characteristics

A horizon:
Value—5 or 6 dry; 4 or 5 moist
Clay content—8 to 15 percent
Calcium carbonate equivalent—5 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 10 percent gravel and cobbles

Upper Bk horizon:
Hue—7.5YR or 10YR
Value—6 or 7 dry; 4 to 6 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—10 to 25 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones

Lower Bk horizon:
Hue—7.5YR or 10YR
Value—6 to 8 dry; 4 to 8 moist
Chroma—3 or 4, dry or moist
Texture—coarse sandy loam, sandy loam, or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—10 to 45 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 80 percent gravel, cobbles, and stones

15—Bullpen-Daklos-Puertecito complex, 2 to 25 percent slopes

Map Unit Setting

General setting: Wagonbox Mesa
Major land resource area: 35—Colorado Plateau
Elevation: 6,990 to 7,270 feet (2,132 to 2,216 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Bullpen and similar soils: 35 percent
Daklos and similar soils: 35 percent
Puertecito and similar soils: 20 percent
Minor components (10 percent):
Rock outcrop (Chinle Formation, Shinarump Conglomerate)

Description of the Bullpen Soil

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 88)
Landform: Mesas (fig. 89)
Geology: Chinle Formation (Triassic), Shinarump Conglomerate Member and Monitor Butte Member

Figure 88.—Profile of the Bullpen soil in map unit 15 (Bullpen-Daklos-Puertecito complex, 2 to 25 percent slopes). Scale is in centimeters.

Parent material: Slope alluvium derived from shale and siltstone over residuum weathered from shale and siltstone
Slope: 4 to 25 percent, southwest to east aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 60 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 6.4 (moderate)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: C
Calcium carbonate content (maximum): About 15 percent

Figure 89.—Landscape of the Bullpen soil in map unit 15 (Bullpen-Daklos-Puertecito complex, 2 to 25 percent slopes). This map unit is on Wagonbox Mesa.

Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, pinyon, roundleaf buffaloberry, and Wright's bird's beak
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-20
Rock fragments	35-45
Bare soil	5-25
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 493345 meters E., 4185882 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); yellowish brown (10YR 5/4) very channery sandy clay loam, brown (7.5YR 4/4) moist; 26 percent clay; weak coarse subangular blocky structure parting to moderate fine granular; slightly hard, friable, moderately sticky and moderately plastic; few very fine roots throughout;

many medium, many very fine, and many fine irregular pores; carbonate, finely disseminated; 50 percent channers; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—3.5 to 7.5 inches (9 to 19 centimeters); light yellowish brown (10YR 6/4) very channery sandy clay loam, yellowish brown (10YR 5/4) moist; 23 percent clay; weak fine subangular blocky structure; very friable, moderately sticky and moderately plastic; common very fine, common fine, and common medium roots throughout; many very fine and many fine irregular pores; carbonate, finely disseminated; 45 percent channers; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk1—7.5 to 17 inches (19 to 43 centimeters); yellowish brown (10YR 5/4) very channery sandy clay loam, dark yellowish brown (10YR 4/4) moist; 27 percent clay; weak medium subangular blocky structure; firm, very sticky and moderately plastic; common very fine, common fine, common medium, and common coarse roots throughout; many medium, many very fine, and many fine irregular pores; common fine irregular carbonate masses in matrix; 45 percent channers; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—17 to 44 inches (43 to 112 centimeters); light yellowish brown (2.5Y 6/4) paragravelly clay loam, light olive brown (2.5Y 5/4) moist; 35 percent clay; moderate fine angular blocky structure; firm, very sticky and moderately plastic; few fine, common medium, and common coarse roots throughout; common very fine and common fine irregular pores; few fine irregular carbonate masses in matrix; 30 percent gravel; slightly effervescent; moderately alkaline, pH 8.2.

Cr—44 to 54 inches (112 to 137 centimeters); weakly cemented, fractured shale.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of less than 35 percent

A horizon:

Hue—7.5YR or 10YR
Value—5 or 6 dry
Chroma—3 or 4, dry or moist
Texture—loam, sandy clay loam, or clay loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 50 percent gravel, channers, paragravel, or parachanners

Bw horizon:

Hue—7.5YR, 10YR, or 2.5Y
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—loam, sandy clay loam, or clay loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 50 percent gravel, channers, paragravel, or parachanners

Bk horizons:

Hue—7.5YR, 10YR, or 2.5Y
Value—5 to 7 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—loam, sandy clay loam, or clay loam
Clay content—22 to 35 percent

Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 50 percent gravel, channers, paragravel, or parachanners

This Bullpen soil differs from the Bullpen series in that it averages 22 to 35 percent clay in the particle-size control section, contains sandy clay loam textures, and has up to 50 percent rock fragments or parafragments in the upper part of the profile. The Bullpen series averages 18 to 27 percent clay in the particle-size control section and up to 35 percent parafragments. In addition, the Bullpen soil in this map unit is moderately deep or deep to a paralithic contact whereas the Bullpen series is deep to a paralithic contact.

Description of the Daklos Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Ustic Haplocambids (fig. 90)
Landform: Mesas and structural benches (fig. 91)
Geology: Chinle Formation (Triassic), Shinarump Conglomerate Member
Parent material: Residuum weathered from sandstone
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 6 to 20 inches; lithic bedrock at a depth of 8 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.0 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 30 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, pinyon, roundleaf buffaloberry, and Wright's bird's beak
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-20
Rock fragments	35-45
Bare soil	5-25
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 495060 meters E., 4184342 meters N., zone 12

Ak—0 to 3.5 inches (0 to 9 centimeters); light yellowish brown (10YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; 16 percent clay; weak medium granular structure;

Figure 90.—Profile of the Daklos soil in map unit 15 (Bullpen-Daklos-Puertecito complex, 2 to 25 percent slopes). Weathered bedrock is at a depth of 39 centimeters; hard bedrock is at a depth of 45 centimeters. Scale is in centimeters.

soft, very friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; common medium irregular, many very fine irregular, many very fine interstitial, and many fine irregular pores; few fine irregular carbonate masses in matrix; 10 percent gravel; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Figure 91.—Landscape of the Daklos soil in map unit 15 (Bullpen-Daklos-Puertecito complex, 2 to 25 percent slopes).

Bk1—3.5 to 10 inches (9 to 26 centimeters); brown (10YR 5/3) extremely channery sandy loam, dark yellowish brown (10YR 4/4) moist; 16 percent clay; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, and common medium roots throughout; many very fine and many fine irregular pores; few fine irregular carbonate masses in matrix and few medium irregular carbonate masses on bottom of rock fragments; 66 percent channers; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—10 to 15.5 inches (26 to 39 centimeters); light yellowish brown (2.5Y 6/4) extremely channery sandy loam, light olive brown (2.5Y 5/4) moist; 18 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common medium roots throughout; common very fine and common fine irregular pores; common coarse irregular carbonate masses on bottom of rock fragments; 70 percent channers; violently effervescent; moderately alkaline, pH 8.0.

Cr—15.5 to 17.5 inches (39 to 45 centimeters); weakly cemented, fractured and weathered sandstone and conglomerate; clear smooth boundary.

R—17.5 to 27.5 inches (45 to 70 centimeters); strongly cemented, fractured sandstone and conglomerate.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

A or Ak horizon:

Hue—10YR or 7.5YR

Value—4 or 5 moist
Texture—sandy loam or fine sandy loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 50 percent gravel or channers
Reaction—Slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bk horizons:
Hue—5YR to 2.5Y
Value—4 to 6 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—15 to 27 percent
Calcium carbonate equivalent—10 to 30 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 75 percent gravel or channers

This Daklos soil is mapped as a taxadjunct to the Daklos series because it contains secondary carbonates in a cambic horizon and is classified as a Lithic Ustic Haplocambid. The Daklos series lacks a cambic horizon and is classified as a Lithic Ustic Torriorthent.

Description of the Puertecito Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Lithic Ustic Haplargids (fig. 92)
Landform: Mesas and structural benches
Geology: Chinle Formation (Triassic), Shinarump Conglomerate Member
Parent material: Slope alluvium derived from sandstone and shale over residuum weathered from sandstone
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 30 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, pinyon, roundleaf buffaloberry, and Wright's bird's beak
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-20
Rock fragments	35-45
Bare soil	5-25
Cyanobacteria crust	0

Figure 92.—Profile of the Puertecito soil in map unit 15 (Bullpen-Daklos-Puertecito complex, 2 to 25 percent slopes). Hard bedrock is at a depth of 25 centimeters. Scale is in centimeters.

Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 494009 meters E., 4184846 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; 15 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and few very fine roots throughout; many very fine interstitial, many very fine irregular, and many fine irregular pores; 13 percent gravel; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Btk—4 to 10 inches (10 to 25 centimeters); reddish yellow (7.5YR 6/6) very flaggy sandy clay loam, strong brown (7.5YR 5/6) moist; 26 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine, few fine, common medium, and common coarse roots throughout; many very fine and many fine irregular pores; few patchy faint clay films between sand grains; few fine irregular carbonate masses in matrix and few coarse irregular carbonate masses on bottom of rock fragments; 3 percent

gravel and 50 percent flagstones; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

R—10 to 19.5 inches (25 to 50 centimeters); very strongly cemented, fractured sandstone and conglomerate.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

A horizon:
Hue—10YR or 7.5YR
Value—4 or 5 moist
Texture—sandy loam or fine sandy loam
Clay content—18 to 28 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—10 to 60 percent gravel or channers

Btk horizon:
Hue—7.5YR or 5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—loam or sandy clay loam
Clay content—18 to 32 percent
Calcium carbonate equivalent—10 to 30 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 75 percent gravel, channers, or flagstones

This Puertocito soil differs from the Puertecito series in that it formed in slope alluvium derived from sandstone and shale over residuum weathered from sandstone, has gravel and flagstones in the control section, and has sandy clay loam textures. The Puertecito series formed in alluvium and colluvium from volcanic rocks and has gravel, cobbles, and stones in the control section.

16—Calladito-Yarts complex, 1 to 6 percent slopes, saline-sodic

Map Unit Setting

General setting: Strike Valley and areas along Halls Creek
Major land resource area: 35—Colorado Plateau
Elevation: 4,710 to 5,670 feet (1,436 to 1,729 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Calladito, saline-sodic and similar soils: 50 percent
Yarts, saline-sodic and similar soils: 35 percent
Minor components (15 percent) and their ecological sites:
Riverwash in channels with no vegetation
Very deep, fine-loamy soils on stream terraces; Alkali Flat (Greasewood)
Very deep, silt loam soils in depressions; Alkali Bottom (Greasewood)

Figure 93.—Profile of the Calladito soil in map unit 16 (Calladito-Yarts complex, 1 to 6 percent slopes, saline-sodic). Scale is in centimeters.

Description of the Calladito, Saline-Sodic Soil

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 93)
Landform: Stream terraces (fig. 94)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 1 to 6 percent, northeast to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 3.1 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None

Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 16 SAR (moderately sodic)
Ecological site name: Alkali Flat (Greasewood)
Ecological site number: R035XY009UT
Present vegetation (in most areas): Greasewood, Indian ricegrass, galleta, cheatgrass, and Pursh seepweed
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	10-20
Rock fragments	0
Bare soil	25-50
Cyanobacteria crust	0-25
Lichen crust	0
Moss crust	0-2
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 501708 meters E., 4186283 meters N., zone 12

Figure 94.—The Calladito soil in map unit 16 (Calladito-Yarts complex, 1 to 6 percent slopes, saline-sodic) on stream terraces near Halls Creek in Strike Valley.

A—0 to 3 inches (0 to 7 centimeters); brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4) moist; 2 percent clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many fine roots throughout; many fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

Bw1—3 to 9.5 inches (7 to 24 centimeters); yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; 3 percent clay; weak very coarse prismatic structure; slightly hard, friable, nonsticky and nonplastic; common fine and common very fine roots throughout; common fine irregular pores; slightly effervescent; strongly alkaline, pH 8.6; clear wavy boundary.

Bw2—9.5 to 21.5 inches (24 to 54 centimeters); brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; 6 percent clay; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and common coarse roots throughout; common fine irregular pores; slightly effervescent; strongly alkaline, pH 9.0; abrupt wavy boundary.

C—21.5 to 71 inches (54 to 180 centimeters); yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; 2 percent clay; massive; loose, nonsticky and nonplastic; common fine roots throughout; common fine irregular pores; slightly effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

A horizon:

Hue—7.5YR or 10YR
Chroma—3 or 4, dry or moist
Clay content—2 to 5 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

Bw horizon:

Hue—7.5YR or 10YR
Chroma—3 or 4, dry or moist
Texture—fine sand or loamy fine sand
Clay content—2 to 10 percent
Calcium carbonate equivalent—1 to 3 percent
SAR—2 to 10
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C horizon:

Hue—7.5YR or 10YR
Texture—fine sand or loamy fine sand
Clay content—1 to 10 percent
Calcium carbonate equivalent—1 to 3 percent
SAR—5 to 15
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 40 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Calladito soil differs from the Calladito series in that it is fluvial in origin. The Calladito series formed in eolian material on stream terraces.

Description of the Yarts, Saline-Sodic Soil

Note: This soil is assigned a saline-sodic phase because it has electrical conductivity and exchangeable sodium content high enough to support greasewood and other salt-tolerant plants.

Figure 95.—Profile of the Yarts soil in map unit 16 (Calladito-Yarts complex, 1 to 6 percent slopes, saline-sodic). Scale is in centimeters.

Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents (fig. 95)
Landform: Stream terraces (fig. 96)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 1 to 6 percent, north to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 7.3 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches

Figure 96.—The Yarts soil in map unit 16 (Calladito-Yarts complex, 1 to 6 percent slopes, saline-sodic) on stream terraces near Halls Creek in Strike Valley.

Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Alkali Bottom (Greasewood)
Ecological site number: R035XY003UT
Present vegetation (in most areas): Needle and thread, greasewood, galleta, Indian ricegrass, and Pursh seepweed
Land capability classification (nonirrigated areas): 6s
Ground cover (percent):

Plant canopy	25-40
Litter (<5 mm)	10-20
Rock fragments	0
Bare soil	25-40
Cyanobacteria crust	0-20
Lichen crust	0
Moss crust	0-2
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 493773 meters E., 4206798 meters N., zone 12

A—0 to 6.5 inches (0 to 16 centimeters); light brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 4/3) moist; 6 percent clay; weak very thick platy structure; slightly

hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine and many fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—6.5 to 19.5 inches (16 to 49 centimeters); light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; 8 percent clay; weak coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; common very fine roots throughout; many very fine and common fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C1—19.5 to 47 inches (49 to 120 centimeters); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; 5 percent clay; massive; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; many very fine interstitial pores; 5 percent coarse irregular masses of oxidized iron in matrix; slightly effervescent; very strongly alkaline, pH 9.6; clear smooth boundary.

C2—47 to 71 inches (120 to 180 centimeters); light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; 9 percent clay; massive; hard, friable, slightly sticky and nonplastic; few fine roots throughout; many very fine interstitial pores; slightly effervescent; very strongly alkaline, pH 9.4.

Range in Characteristics

A horizon:

Hue—7.5YR or 10YR
Chroma—3 or 4, dry or moist
Texture—fine sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm

Bw horizon:

Hue—7.5YR or 10YR
Chroma—3 or 4, dry or moist
Texture—fine sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm

C horizons:

Hue—7.5YR or 10YR
Value—6 or 7 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—loamy fine sand, fine sandy loam, or very fine sandy loam
Clay content—3 to 20 percent
Calcium carbonate equivalent—1 to 3 percent
SAR—5 to 15
Electrical conductivity—4 to 16 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—moderately alkaline to very strongly alkaline (pH 7.9 to 11.0)

17—Catahoula-Rock outcrop complex, 35 to 75 percent slopes

Map Unit Setting

General setting: Escarpments along Circle Cliffs, Scenic Drive, and South Draw
Major land resource area: 35—Colorado Plateau
Elevation: 4,580 to 7,310 feet (1,397 to 2,229 meters)

Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Catahoula and similar soils: 40 percent
Rock outcrop, Wingate Sandstone: 40 percent
Minor components (20 percent) and their ecological sites:
- Shallow, loamy-skeletal soils on escarpments; Semidesert Very Steep Stony Loam (Salina Wildrye)
- Shallow and moderately deep, clayey soils on hills and escarpments; Semidesert Shallow Clay (Shadscale-Utah Juniper)
- Shallow and moderately deep, loamy-skeletal soils with calcic horizons on hills; Semidesert Shallow Loam (Utah Juniper-Pinyon)
- Remorris soils on hills and escarpments (shallow, loamy soils); Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)

Description of the Catahoula Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocambids (fig. 97)
Landform: Talus slopes and escarpments (fig. 98)
Geology: Colluvial deposits (Quaternary)
Parent material: Colluvium derived from sandstone over residuum weathered from sandstone and shale
Slope: 35 to 75 percent, east to northwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 20 to 60 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 3.3 (low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: B
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)
Ecological site number: R035XY263UT
Present vegetation (in most areas): Utah juniper, alderleaf mountain mahogany, twoneedle pinyon, Utah serviceberry, roundleaf buffaloberry, Salina wildrye, and Wright's bird's beak
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	5-15
Rock fragments	40-50
Bare soil	5-15
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0

Figure 97.—Profile of the Catahoula soil in map unit 17 (Catahoula-Rock outcrop complex, 35 to 75 percent slopes). Scale is in centimeters.

Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 495826 meters E., 4191637 meters N., zone 12

A—0 to 3 inches (0 to 7 centimeters); reddish brown (5YR 5/4) gravelly fine sandy loam, reddish brown (5YR 4/4) moist; 15 percent clay; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine roots throughout; common very fine irregular pores; 25 percent gravel, 3 percent cobbles, and 1 percent stones; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

BA—3 to 7 inches (7 to 18 centimeters); reddish brown (5YR 5/4) gravelly fine sandy loam, yellowish red (5YR 4/6) moist; 16 percent clay; weak fine subangular blocky

Figure 98.—The Catahoula soil in map unit 17 (Catahoula-Rock outcrop complex, 35 to 75 percent slopes) in talus at the base of the Wingate Sandstone cliffs.

structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; common very fine irregular pores; 15 percent gravel and 3 percent cobbles; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bw—7 to 13.5 inches (18 to 34 centimeters); reddish brown (5YR 5/4) stony sandy clay loam, yellowish red (5YR 4/6) moist; 31 percent clay; moderate medium subangular blocky structure; moderately hard, firm, moderately sticky and moderately plastic; common very fine and common fine roots throughout and common medium roots at top of horizon; common fine irregular pores; 10 percent gravel, 5 percent cobbles, and 5 percent stones; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

BC—13.5 to 31.5 inches (34 to 80 centimeters); yellowish red (5YR 5/6) very stony sandy loam, yellowish red (5YR 4/6) moist; 15 percent clay; weak medium

subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, and common medium roots throughout; common fine irregular and common fine tubular pores; 10 percent gravel, 10 percent cobbles, and 15 percent stones; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C—31.5 to 40.5 inches (80 to 103 centimeters); yellowish red (5YR 5/6) very stony sandy loam, yellowish red (5YR 4/6) moist; 15 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; common very fine irregular pores; 10 percent gravel, 15 percent cobbles, and 25 percent stones; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

R—40.5 to 50.5 inches (103 to 128 centimeters); very strongly cemented fractured sandstone.

Range in Characteristics

Content of coarse fragments in the particle-size control section: Average of more than 35 percent

Note: Not all pedons contain an A horizon

A horizon:

Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 to 6 moist
Texture—loamy fine sand or fine sandy loam
Clay content—5 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—10 to 40 percent gravel, cobbles, and stones

BA, Bw, and BC horizons:

Hue—5YR or 7.5YR
Chroma—4 or 6, dry or moist
Texture—sandy clay loam, fine sandy loam, or sandy loam
Clay content—15 to 35 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 70 percent gravel, cobbles, and stones

C horizon:

Hue—5YR or 7.5YR
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones

This Catahoula soil is mapped as a taxadjunct to the Catahoula series because it contains a cambic horizon and is classified as an Ustic Haplocambid. The Catahoula series is classified as an Ustic Torriorthent. In addition, the Catahoula soil in this map unit is moderately deep or deep to bedrock whereas the Catahoula series is very deep.

Description of the Rock Outcrop, Wingate Sandstone

This component is characterized by very tall, nearly continuous, nearly vertical cliffs and escarpments. The lithology is Wingate Sandstone (Triassic). The vertical relief ranges from several tens to several hundreds of feet. Travel by any type of wheeled vehicle is virtually impossible. Travel by foot is extremely difficult or nearly impossible

and is usually hazardous. This component is a natural barrier to livestock and most other terrestrial animals. The nearly vertical areas are barren but there may be vegetation growing in cracks and crevices or in areas of colluvial deposition.

18—Chilton-Begay complex, 1 to 25 percent slopes

Map Unit Setting

General setting: Scenic Drive
Major land resource area: 35—Colorado Plateau
Elevation: 5,480 to 5,880 feet (1,669 to 1,793 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Chilton and similar soils: 55 percent
Begay and similar soils: 20 percent
Minor components (25 percent) and their ecological sites:
- Remorris soils on dip slopes of cuestas (shallow, loamy soils); Semidesert Shallow Sandy Loam (Shadscale)
- Riverwash in channels with no vegetation

Description of the Chilton Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocambids (fig. 99)
Landform: Alluvial fans and stream terraces (fig. 100)
Geology: Quaternary alluvial deposits
Parent material: Alluvium derived from sandstone and shale
Slope: 2 to 25 percent, northeast to southeast aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 5.2 (moderate)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 2 SAR (slightly sodic)
Ecological site name: Semidesert Loam (Shadscale)
Ecological site number: R035XY242UT
Present vegetation (in most areas): Galleta, low rabbitbrush, shadscale, blue grama, crispleaf buckwheat, and Torrey's jointfir
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-15
Rock fragments	35-60
Bare soil	10-25

Figure 99.—Profile of the Chilton soil in map unit 18 (Chilton-Begay complex, 1 to 25 percent slopes). Scale is in centimeters.

Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479433 meters E., 4234264 meters N., zone 12

A—0 to 4.5 inches (0 to 11 centimeters); yellowish red (5YR 5/6) cobbly loam, reddish brown (2.5YR 4/4) moist; 17 percent clay; weak coarse subangular blocky

Figure 100.—Landscape of the Chilton soil in map unit 18 (Chilton-Begay complex, 1 to 25 percent slopes) in the foreground.

structure; common fine roots throughout; many very fine irregular pores; 5 percent gravel, 10 percent cobbles, and 3 percent stones; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bw—4.5 to 19.5 inches (11 to 49 centimeters); yellowish red (5YR 5/6) very stony sandy loam, reddish brown (2.5YR 4/4) moist; 18 percent clay; weak medium subangular blocky structure; common fine roots throughout; many very fine irregular pores; 5 percent gravel, 20 percent cobbles, and 25 percent stones; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

By—19.5 to 32 inches (49 to 81 centimeters); yellowish red (5YR 5/6) very gravelly loam, reddish brown (2.5YR 4/4) moist; 24 percent clay; weak medium subangular blocky structure; common fine roots throughout; many very fine irregular pores; common coarse irregular gypsum crystals on bottom of rock fragments; 25 percent gravel, 5 percent cobbles, and 5 percent stones; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C—32 to 71 inches (81 to 180 centimeters); yellowish red (5YR 5/6) very gravelly sandy loam, reddish brown (2.5YR 4/4) moist; 17 percent clay; massive; common fine roots throughout; many very fine irregular pores; 35 percent gravel, 10 percent cobbles, and 5 percent stones; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

A horizon:

Hue—5YR or 2.5YR
Value—4 to 6 dry; 3 or 4 moist

Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—12 to 20 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 50 percent gravel, cobbles, or stones

Bw, Bk, or By horizons:
Hue—5YR or 2.5YR
Value—4 or 5 dry
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—15 to 25 percent
Calcium carbonate equivalent—1 to 15 percent
Gypsum content—0 to 5 percent
Sodium adsorption ratio—0 to 2
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 60 percent gravel, cobbles, or stones
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon:
Hue—5YR or 2.5YR
Value—4 to 6 dry
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—12 to 20 percent
Calcium carbonate equivalent—1 to 15 percent
Gypsum content—0 to 5 percent
Sodium adsorption ratio—0 to 2
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, or stones
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Chilton soil is mapped as a taxadjunct to the Chilton series because it contains a cambic horizon and is classified as an Ustic Haplocambid. The Chilton series lacks a cambic horizon and is classified as an Ustic Torriorthent.

Description of the Begay Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 101)
Landform: Stream terraces (fig. 102)
Geology: Quaternary alluvial deposits
Parent material: Alluvium derived from sandstone
Slope: 1 to 5 percent, northeast to southeast aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 7.9 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)

Figure 101.—Profile of the Begay soil in map unit 18 (Chilton-Begay complex, 1 to 25 percent slopes). Scale is in centimeters.

Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): Galleta, Indian ricegrass, shadscale, fourwing saltbush, and low rabbitbrush
Land capability classification (nonirrigated areas): 6s
Ground cover (percent):

Plant canopy	25-40
Litter (<5 mm)	5-10
Rock fragments	10-20
Bare soil	30-45

Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 482999 meters E., 4228945 meters N., zone 12

A—0 to 4.5 inches (0 to 11 centimeters); reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; 14 percent clay; weak very thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and common medium roots throughout; many very fine and many fine irregular pores; slightly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Bk—4.5 to 17 inches (11 to 43 centimeters); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; 16 percent clay; weak very thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and few very fine roots throughout; many very fine irregular pores; few fine irregular carbonate masses in matrix; strongly effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

BC—17 to 59 inches (43 to 150 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 14 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; many very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2.

Figure 102.—Landscape of the Begay soil in map unit 18 (Chilton-Begay complex, 1 to 25 percent slopes) in the foreground.

Range in Characteristics

A horizon:
- Hue—5YR or 2.5YR
- Value—4 or 5 dry
- Chroma—4 or 6, dry or moist
- Texture—sandy loam, fine sandy loam, or very fine sandy loam
- Clay content—10 to 15 percent
- Calcium carbonate equivalent—1 to 10 percent
- Electrical conductivity—0 to 2 mmhos/cm
- Rock fragments—0 to 5 percent gravel
- Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bk or Bw horizons:
- Hue—5YR or 2.5YR
- Value—5 or 6 dry; 4 or 5 moist
- Chroma—3 to 6 dry; 4 or 6 moist
- Texture—sandy loam, fine sandy loam, or very fine sandy loam
- Clay content—10 to 18 percent
- Calcium carbonate equivalent—1 to 10 percent
- Electrical conductivity—0 to 2 mmhos/cm
- Rock fragments—0 to 5 percent gravel
- Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

BC or C horizons:
- Hue—5YR or 2.5YR
- Value—4 or 5 moist
- Chroma—4 or 6, dry or moist
- Texture—sandy loam or fine sandy loam
- Clay content—10 to 18 percent
- Calcium carbonate equivalent—1 to 10 percent
- Electrical conductivity—0 to 2 mmhos/cm
- Rock fragments—0 to 15 percent gravel or paragravel
- Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

19—Chinchin-Badland complex, 25 to 50 percent slopes

Map Unit Setting

General setting: Areas adjacent to Grand Staircase-Escalante National Monument and structural benches below Circle Cliffs
Major land resource area: 35—Colorado Plateau
Elevation: 5,100 to 6,900 feet (1,555 to 2,104 meters)
Mean annual precipitation: 9 to 12 inches (229 to 305 millimeters)
Mean annual air temperature: 45 to 52 degrees F (7.0 to 11.0 degrees C)
Mean annual soil temperature: 47 to 54 degrees F (8.1 to 12.1 degrees C)
Frost-free period: 120 to 160 days

Map Unit Composition

Chinchin and similar soils: 45 percent
Badland, Chinle Formation: 40 percent
Minor components (15 percent):
- Moderately deep, loamy soils with natric horizons and vertic properties on hills (semidesert, mesic)
- Shallow, loamy soils on hills (semidesert, mesic)

Description of the Chinchin Soil

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Calciargids
Landform: Escarpments on structural benches and hillslopes on structural benches
Geology: Chinle Formation (Triassic)
Parent material: Residuum weathered from shale
Slope: 25 to 50 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 1.7 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 30 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Clay (Shadscale-Utah Juniper)
Ecological site number: R035XY239UT
Present vegetation (in most areas): Galleta, Indian ricegrass, roundleaf buffaloberry, shadscale saltbush, bottlebrush squirreltail, black sagebrush, crispleaf buckwheat, other shrubs, and Utah juniper
Land capability classification (nonirrigated areas): 7s

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 482415 meters E., 4183878 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); reddish brown (2.5YR 5/4) gravelly loam, reddish brown (2.5YR 4/4) moist; 24 percent clay; weak fine platy and moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine irregular pores; 14 percent gravel, 4 percent cobbles, and 4 percent stones; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Btk—4 to 10 inches (10 to 26 centimeters); reddish brown (2.5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) moist; 34 percent clay; strong fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few fine and few very fine roots; discontinuous distinct carbonate coats on vertical faces of peds and discontinuous distinct clay films on vertical faces of peds; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

R—10 (26 centimeters); indurated shale.

Range in Characteristics

Clay content: 27 to 35 percent
Rock fragments (content and size): 5 to 15 percent; dominantly gravel

A horizon:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 to 6, dry or moist

Btk horizon:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist

Chroma—4 to 6, dry or moist
Texture—clay loam or loam
Clay content—27 to 35 percent
Rock fragments—0 to 30 percent gravel
Calcium carbonate equivalent—10 to 30 percent

Description of the Badland, Chinle Formation

This component consists of areas of steep, barren exposures of shale or mudstone, usually devoid of vegetation, that are dissected by many intermittent drainage channels. Shallow gullies and severe rilling of the surface are common.

20—Chipeta, saline-sodic-Stent family complex, 30 to 70 percent slopes

Map Unit Setting

General setting: Strike Valley and west-facing escarpments
Major land resource area: 35—Colorado Plateau
Elevation: 4,990 to 5,960 feet (1,522 to 1,818 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Chipeta, saline-sodic and similar soils: 65 percent
Stent family and similar soils: 25 percent
Minor components (10 percent):
Rock outcrop (Mancos Shale)
Rock outcrop (Mesaverde Formation sandstone)

Description of the Chipeta, Saline-Sodic Soil

Taxonomic classification: Clayey, mixed, active, calcareous, mesic, shallow Typic Torriorthents (fig. 103)
Landform: Escarpments (fig. 104)
Geology: Mancos Shale (Cretaceous), Tununk Member
Parent material: Residuum weathered from shale
Slope: 30 to 70 percent, southeast to northwest aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 9 to 14 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 2.0 (very low)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 18 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Desert Clay (Castle Valley Saltbush)
Ecological site number: R035XY103UT

Figure 103.—Profile of the Chipeta soil in map unit 20 (Chipeta, saline-sodic-Stent family complex, 30 to 70 percent slopes). Soft bedrock is at a depth of 28 centimeters. Scale is in centimeters.

Present vegetation (in most areas): Valley saltbush, Brenda's yellow cryptantha, Jones' pepperweed, and saline wildrye

Land capability classification (nonirrigated areas): 7s

Ground cover (percent):

Plant canopy	5-15
Litter (<5 mm)	5-10
Rock fragments	10-25
Bare soil	65-80
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 501603 meters E., 4188665 meters N., zone 12

AC—0 to 1.5 inches (0 to 4 centimeters); light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; 29 percent clay; moderate very fine granular structure; soft, friable, slightly sticky and moderately plastic; common very fine vesicular pores; common fine gypsum crystals; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Cnyz1—1.5 to 6.5 inches (4 to 17 centimeters); light brownish gray (2.5Y 6/2) parachannery silty clay loam, grayish brown (2.5Y 5/2) moist; 35 percent clay;

Figure 104.—The Chipeta soil in map unit 20 (Chipeta, saline-sodic-Stent family complex, 30 to 70 percent slopes).

massive; slightly hard, friable, slightly sticky and very plastic; common very fine roots throughout; common very fine irregular pores; common medium gypsum crystals; 15 percent parachanners; slightly effervescent; strongly alkaline, pH 8.8; clear smooth boundary.

Cnyz2—6.5 to 11 inches (17 to 28 centimeters); grayish brown (2.5Y 5/2) parachannery silty clay loam, dark grayish brown (2.5Y 4/2) moist; 38 percent clay; massive; slightly hard, friable, slightly sticky and very plastic; common very fine irregular pores; many medium gypsum crystals; 30 percent parachanners; slightly effervescent; strongly alkaline, pH 8.8; gradual smooth boundary.

Cr—11 to 21 inches (28 to 53 centimeters); weakly cemented shale.

Range in Characteristics

AC horizon:

Hue—2.5Y or 5Y
Value—5 or 6, dry or moist
Texture—silt loam or silty clay loam
Clay content—20 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—5 to 18 percent
SAR—5 to 10
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—none
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Cnyz1 horizon:

Hue—2.5Y or 5Y
Value—5 or 6, dry or moist

Texture—silt loam or silty clay loam
Clay content—25 to 39
Calcium carbonate equivalent—0 to 10 percent
Gypsum content—5 to 20 percent
SAR—10 to 20
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 20 percent parachanners

Cnyz2 horizon:
Hue—2.5Y or 5Y
Value—4 to 6, dry or moist
Texture—silt loam or silty clay loam
Clay content—25 to 39 percent
Calcium carbonate equivalent—0 to 10 percent
Gypsum content—10 to 25 percent
SAR—10 to 20
Electrical conductivity—10 to 18 mmhos/cm
Rock fragments—10 to 35 percent parachanners

Description of the Stent Family Soil

Note: This soil is correlated at the family level because it is moderately deep to bedrock whereas the Stent series is very deep.

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Typic Haplocalcids (fig. 105)
Landform: Escarpments (fig. 106)
Geology: Mesaverde Formation (Cretaceous)
Parent material: Colluvium derived from sandstone

Figure 105.—Pit in the Stent family soil in map unit 20 (Chipeta, saline-sodic-Stent family complex, 30 to 70 percent slopes). Scale is in centimeters.

Figure 106.—Landscape of the Stent family soil in map unit 20 (Chipeta, saline-sodic-Stent family complex, 30 to 70 percent slopes) in colluvium on escarpments.

Slope: 30 to 70 percent, southeast to northwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 23 to 34 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 2.0 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: B
Calcium carbonate content (maximum): About 20 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Clay (Castle Valley Saltbush)
Ecological site number: R035XY103UT
Present vegetation (in most areas): Valley saltbush, Brenda's yellow cryptantha, Jones' pepperweed, and Salina wildrye
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	5-15
Litter (<5 mm)	5-10
Rock fragments	25-45
Bare soil	50-65
Cyanobacteria crust	0
Lichen crust	0

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 501634 meters E., 4188606 meters N., zone 12

AB—0 to 3.5 inches (0 to 9 centimeters); very pale brown (10YR 7/3) gravelly sandy loam, yellowish brown (10YR 5/4) moist; 10 percent clay; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; common very fine vesicular pores; common fine irregular carbonate masses in matrix; 25 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; clear smooth boundary.

Bk—3.5 to 24.5 inches (9 to 62 centimeters); pink (7.5YR 7/3) very gravelly sandy loam, strong brown (7.5YR 5/6) moist; 12 percent clay; weak very fine granular structure; slightly hard, friable, nonsticky and slightly plastic; common very fine, common fine, and common medium roots throughout; common very fine irregular pores; common medium carbonate masses in matrix; 18 percent gravel and 17 percent stones; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; clear smooth boundary.

R—24.5 to 34.5 inches (62 to 87 centimeters); indurated sandstone.

Range in Characteristics

AB horizon:

Hue—7.5YR or 10YR
Value—5 or 6 moist
Chroma—3 to 6 dry; 6 or 8 moist
Texture—fine sandy loam or sandy loam
Clay content—8 to 15 percent
Calcium carbonate equivalent—2 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—10 to 40 percent gravel, cobbles, and stones

Bk horizon:

Hue—7.5YR or 10YR
Value—6 or 7 dry; 4 or 5 moist
Chroma—3 or 4 dry; 6 or 8 moist
Texture—fine sandy loam or sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—5 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—10 to 45 percent gravel, cobbles, and stones
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

21—Daklos-Lazear-Rock outcrop complex, 5 to 60 percent slopes

Map Unit Setting

General setting: Areas adjacent to Grand Staircase-Escalante National Monument and structural benches below Circle Cliffs
Major land resource area: 35—Colorado Plateau
Elevation: 5,300 to 6,860 feet (1,616 to 2,091 meters)
Mean annual precipitation: 9 to 12 inches (229 to 305 millimeters)

Mean annual air temperature: 45 to 52 degrees F (7.0 to 11.0 degrees C)
Mean annual soil temperature: 47 to 54 degrees F (8.1 to 12.1 degrees C)
Frost-free period: 120 to 160 days

Map Unit Composition

Daklos and similar soils: 40 percent
Lazear, dry and similar soils: 35 percent
Rock outcrop, Shinarump Member, Chinle Formation: 15 percent
Minor components (less than 1 percent):
Shallow, loamy soils with calcic horizons on mesas and structural benches (semidesert, mesic)

Description of the Daklos Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Dissected structural benches
Geology: Chinle Formation (Triassic)
Parent material: Residuum, slope alluvium, and colluvium derived from sandstone over residuum weathered from sandstone
Slope: 5 to 60 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 16 inches; lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.8 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, broom snakeweed, green Mormon tea, Fremont's mahonia, galleta, Indian ricegrass, other shrubs, roundleaf buffaloberry, twoneedle pinyon, and yellow rabbitbrush
Land capability classification (nonirrigated areas): 7s

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 480130 meters E., 4197437 meters N., zone 12

A—0 to 1 inch (0 to 2 centimeters); yellowish brown (10YR 5/4) extremely gravelly loamy fine sand, dark yellowish brown (10YR 4/4) moist; 8 percent clay; moderate thin platy structure; soft, very friable, nonsticky and nonplastic; common fine vesicular pores; 20 percent gravel and 10 percent channers; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bw—1 to 3.5 inches (2 to 9 centimeters); yellowish brown (10YR 5/4) very gravelly fine sandy loam, dark yellowish brown (10YR 4/4) moist; 11 percent clay; weak fine subangular blocky and moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; 40 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C—3.5 to 12 inches (9 to 31 centimeters); light yellowish brown (10YR 6/4) very gravelly fine sandy loam, yellowish brown (10YR 5/4) moist; 13 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine, common fine, common medium, and few coarse roots; 40 percent gravel and 20 percent channers; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

2Cr—12 to 14.5 inches (31 to 37 centimeters); moderately cemented weathered sandstone.

R—14.5 inches (37 centimeters); indurated sandstone.

Range in Characteristics

Clay content: 10 to 20 percent
Rock fragments (content and size): 30 to 45 percent; dominantly gravel and channers

A horizon:
Hue—10YR or 7.5YR
Value—3 to 5, dry or moist
Chroma—3 or 4, dry or moist

Bw or C horizons:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 8, dry or moist
Chroma—3 to 6, dry or moist
Texture—fine sandy loam, sandy loam, or sand

Description of the Lazear, Dry Soil

Note: A dry phase is assigned to this soil to account for the Utah juniper-pinyon pine vegetative community. The Lazear series normally supports a grass-shrub vegetative community.

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Dissected hillslopes on structural benches
Geology: Chinle Formation (Triassic)
Parent material: Residuum
Slope: 5 to 60 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 10 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 1.4 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 2 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, broom snakeweed, green Mormon tea, Fremont's mahonia, galleta, Indian ricegrass, other shrubs, roundleaf buffaloberry, twoneedle pinyon, and yellow rabbitbrush
Land capability classification (nonirrigated areas): 7s

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 421089 meters E., 4129371 meters N., zone 12

A—0 to 4.5 inches (0 to 11 centimeters); pale brown (10YR 6/3) very gravelly loam, yellowish brown (10YR 5/4) moist; 21 percent clay; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, few fine, and few medium roots; 25 percent gravel, 10 percent channers, and 5 percent flagstones; strongly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

C—4.5 to 11 inches (11 to 28 centimeters); pale yellow (2.5Y 7/3) parachannery loam, light olive brown (2.5Y 5/3) moist; 26 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; common very fine, few fine, and few medium roots; 15 percent parachanners; strongly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

R—11 inches (28 centimeters); indurated sandstone and siltstone.

Range in Characteristics

A horizon:

Hue—2.5YR, 5YR, or 7.5YR
Value—4 to 6 dry; 4 or 5 moist
Chroma—3 to 6, dry or moist

C horizon:

Hue—2.5YR, 5YR, or 7.5YR
Value—4 to 7 dry; 4 to 6 moist
Chroma—3 to 6, dry or moist
Texture—fine sandy loam, sandy loam, or loam
Rock fragments—0 to 30 percent gravel, 0 to 20 percent cobbles, and 0 to 10 percent stones

Description of the Rock Outcrop, Shinarump Member, Chinle Formation

This component is characterized by nearly level to strongly sloping rock outcrop with discontinuous cliffs and escarpments. The lithology is conglomerate. The vertical relief is commonly a few feet, and the continuity of the cliffs is broken. Typically, there are enough cliffs to impede vehicular travel to some degree. The area can be negotiated by full-sized four-wheeled vehicles with difficulty. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

22—Daklos-Reef-Rock outcrop complex, 6 to 60 percent slopes

Map Unit Setting

General setting: South Desert (fig. 107)
Major land resource area: 35—Colorado Plateau
Elevation: 5,070 to 6,740 feet (1,545 to 2,053 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Figure 107.—Landscape of map unit 22 (Daklos-Reef-Rock outcrop complex, 6 to 60 percent slopes). This map unit is in South Desert.

Map Unit Composition

Daklos and similar soils: 60 percent
Reef and similar soils: 15 percent
Rock outcrop, Carmel Formation sandy limestone: 15 percent
Minor components (10 percent) and their ecological sites:
- Retsabal soils on cuestas (shallow gypseous soils with gypsic horizons); Semidesert Shallow Gypsum (Mormontea)
- Reef, steep soils on cuestas (shallow, loamy-skeletal soils); Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)

Description of the Daklos Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 108)
Landform: Dip slopes of cuestas
Geology: Carmel Formation sandstone (Jurassic)
Parent material: Residuum weathered from arenaceous limestone
Slope: 6 to 25 percent, north to west aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 2 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.2 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None

Figure 108.—Profile of the Daklos soil in map unit 22 (Daklos-Reef-Rock outcrop complex, 6 to 60 percent slopes). Bedrock is at a depth of 10 centimeters. Scale is in centimeters.

Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 30 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Torrey's jointfir, Bigelow sage, low rabbitbrush, shadscale, Utah juniper, crispleaf buckwheat, and James' galleta
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	10-25
Litter (<5 mm)	0-5
Rock fragments	5-50
Bare soil	20-30
Cyanobacteria crust	5-65
Lichen crust	0-5
Moss crust	0
Salt crust	0
Gypsum crust	0-10

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 487679 meters E., 4230182 meters N., zone 12

C—0 to 4 inches (0 to 10 centimeters); yellowish brown (10YR 5/4) very channery sandy loam, dark yellowish brown (10YR 4/4) moist; 15 percent clay; massive; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; 50 percent channers; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

R—4 to 14 inches (10 to 35 centimeters); very strongly cemented, fractured arenaceous limestone; common fine roots in cracks and common medium roots at top of horizon.

Range in Characteristics

C horizon:

Hue—10YR
Value—5 or 6 dry; 4 to 6 moist
Chroma—3 to 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—15 to 30 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 65 percent channers

Description of the Reef Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Canyon side slopes on dip slopes of cuestas (fig. 109)
Geology: Carmel Formation sandstone (Jurassic)

Figure 109.—The Reef soil in map unit 22 (Daklos-Reef-Rock outcrop complex, 6 to 60 percent slopes) on canyon sides of dissected dip slopes of cuestas.

Parent material: Colluvium derived from arenaceous limestone and/or residuum weathered from arenaceous limestone
Slope: 25 to 60 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 2.1 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 25 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Ecological site number: R035XY240UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, desert needlegrass, galleta, green ephedra, roundleaf buffaloberry, and shadscale
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	10-25
Litter (<5 mm)	5-15
Rock fragments	5-10
Bare soil	15-25
Cyanobacteria crust	40-60
Lichen crust	0-5
Moss crust	0
Salt crust	0
Gypsum crust	0-10

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 485537 meters E., 4236045 meters N., zone 12

C1—0 to 5.5 inches (0 to 14 centimeters); reddish brown (5YR 4/4) very channery loam, dark reddish brown (5YR 3/4) moist; 18 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 35 percent channers; violently effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.
C2—5.5 to 19.5 inches (14 to 49 centimeters); reddish brown (5YR 4/4) very channery loam, dark reddish brown (5YR 3/4) moist; 17 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; common fine irregular gypsum crystals in matrix; 40 percent channers; violently effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.
R—19.5 to 29 inches (49 to 74 centimeters); very strongly cemented arenaceous limestone.

Range in Characteristics

C horizons:
Texture—loam, fine sandy loam, or sandy loam
Clay content—8 to 18 percent

Figure 110.—An area of map unit 23 (Daklos-Rizno-Rock outcrop complex, 15 to 60 percent slopes) on mountain slopes.

Calcium carbonate equivalent—15 to 25 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 65 percent channers

Description of the Rock Outcrop, Carmel Formation Sandy Limestone

This component is characterized by strongly sloping to steep rock outcrop. The lithology is sandy limestone. The vertical relief ranges from a few feet to several feet, and the continuity of cliffs is broken. Typically, the area is steep enough and there are enough cliffs to make travel by full-sized four-wheeled vehicles very difficult. There are usually no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

23—Daklos-Rizno-Rock outcrop complex, 15 to 60 percent slopes

Map Unit Setting

General setting: Miners Mountain and Burr Trail areas (fig. 110)
Major land resource area: 35—Colorado Plateau
Elevation: 4,990 to 7,610 feet (1,521 to 2,320 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)

Figure 111.—Profile of the Daklos soil in map unit 23 (Daklos-Rizno-Rock outcrop complex, 15 to 60 percent slopes). Bedrock is at a depth of 20 centimeters. Scale is in centimeters.

Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Daklos and similar soils: 40 percent
Rizno and similar soils: 25 percent
Rock outcrop, Kaibab Limestone: 20 percent
Minor components (15 percent) and their ecological sites:
- Riverwash in channels with no vegetation
- Shallow loamy soils with visible gypsum on side slopes; Semidesert Steep Shallow Loam (Utah Juniper-Two Needle Pinyon)
- Shallow sandy soils on structural benches; Semidesert Shallow Sand (Utah Juniper-Pinyon)

Description of the Daklos Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 111)
Landform: Canyons and mountain slopes
Geology: Kaibab Limestone (Permian)
Parent material: Colluvium derived from sandstone and/or residuum weathered from sandstone
Slope: 15 to 60 percent, north to northwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Ecological site number: R035XY240UT
Present vegetation (in most areas): Salina wildrye, twoneedle pinyon, roundleaf buffaloberry, Utah juniper, and galleta
Land capability classification (nonirrigated areas): 7e
Ground cover (percent): (fig. 112)

Plant canopy	20-30
Litter (<5 mm)	10-15
Rock fragments	50-60
Bare soil	5-10
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 112.—Typical surface of the Daklos soil in map unit 23 (Daklos-Rizno-Rock outcrop complex, 15 to 60 percent slopes).

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 494069 meters E., 4188648 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); pale brown (10YR 6/3) gravelly very fine sandy loam, yellowish brown (10YR 5/4) moist; 14 percent clay; weak fine subangular blocky structure; common very fine roots throughout; many very fine irregular pores; 20 percent gravel; violently effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

2C—4 to 8 inches (10 to 20 centimeters); very pale brown (10YR 7/3) very channery loam, light yellowish brown (10YR 6/4) moist; 16 percent clay; massive; common fine, common medium, and common very fine roots throughout; many very fine irregular pores; 50 percent channers; strongly effervescent; moderately alkaline, pH 8.4.

2R—8 to 17.5 inches (20 to 45 centimeters); indurated sandstone.

Range in Characteristics

Note: Some pedons have silt loam textures and paragravel or parachanners overlying the bedrock

A horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—5 or 6 dry; 4 or 5 moist
- Chroma—3 or 4, dry or moist
- Texture—sandy loam, fine sandy loam, or very fine sandy loam
- Clay content—12 to 18 percent
- Calcium carbonate equivalent—5 to 15 percent
- Rock fragments—15 to 50 percent gravel or channers

C or 2C horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—6 or 7 dry; 4 to 6 moist
- Chroma—3 or 4, dry or moist
- Texture—sandy loam, fine sandy loam, or loam
- Clay content—12 to 18 percent
- Calcium carbonate equivalent—5 to 15 percent
- Rock fragments—40 to 50 percent gravel, cobbles, channers, or flagstones

This Daklos soil differs from the Daklos series in that it has hue of 5YR and 7.5YR whereas the Daklos series typically has hue of 10YR.

Description of the Rizno Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 113)
Landform: Canyons and mountain slopes
Geology: Kaibab Limestone (Permian)
Parent material: Residuum weathered from sandstone and/or slope alluvium derived from sandstone
Slope: 15 to 35 percent, northeast to southwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.4 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None

Figure 113.—Profile of the Rizno soil in map unit 23 (Daklos-Rizno-Rock outcrop complex, 15 to 60 percent slopes). Bedrock is at a depth of 10 centimeters. Scale is in 10-centimeter increments.

Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, Salina wildrye, roundleaf buffaloberry, and green ephedra
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-25
Litter (<5 mm)	20-25
Rock fragments	35-45
Bare soil	2-105
Cyanobacteria crust	2-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 494003 meters E., 4188715 meters N., zone 12

C—0 to 4 inches (0 to 10 centimeters); light yellowish brown (10YR 6/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; 14 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 25 percent gravel; violently effervescent; moderately alkaline, pH 8.4; very abrupt wavy boundary.

R—4 to 14 inches (10 to 35 centimeters); indurated sandstone.

Range in Characteristics

Note: Some pedons may have an A horizon at the soil surface

C horizon:

Hue—5YR, 7.5YR, or 10YR
Value—4 to 6, dry or moist
Chroma—3 or 4, dry or moist
Texture—fine sandy loam or sandy loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Rock fragments—0 to 35 percent gravel or channers and 0 to 40 percent parafragments

This Rizno soil differs from the Rizno series in that it has hue of 7.5YR and 10YR whereas the Rizno series typically has hue of 5YR and 2.5YR.

Description of the Rock Outcrop, Kaibab Limestone

This component is characterized by many cliffs and escarpments. The lithology is limestone. The vertical relief is commonly less than a few feet but the continuity of cliffs and escarpments is nearly continuous. Typically, the vertical relief and continuity of cliffs make travel by full-sized four-wheeled vehicles nearly impossible. The impediment to foot travel or to animals is usually only slight to moderate. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

24—Earlweed-Anasazi complex, 5 to 22 percent slopes

Map Unit Setting

General setting: Mesa adjacent to Glen Canyon National Recreation Area and areas above Circle Cliffs and southeast of Red Slide (Capitol Reef National Park)
Major land resource area: 35—Colorado Plateau
Elevation: 5,320 to 7,060 feet (1,622 to 2,153 meters)
Mean annual precipitation: 10 to 14 inches (250 to 350 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.0 to 13.0 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.1 to 14.1 degrees C)
Frost-free period: 135 to 165 days

Map Unit Composition

Earlweed and similar soils: 60 percent
Anasazi and similar soils: 30 percent
Minor components (10 percent):

Very deep soils with loamy very fine sand or very fine sand textures on dunes on structural benches and interfluves (semidesert, mesic)
Shallow sandy soils on structural benches (semidesert, mesic)

Description of the Earlweed Soil

Taxonomic classification: Sandy, mixed, mesic Ustic Haplocalcids
Landform: Coppice mounds and dunes on interfluves on hills, mesas, and structural benches
Geology: Dune deposits (Quaternary)
Parent material: Eolian deposits
Slope: 5 to 22 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 6.0 (moderate)
Shrink-swell potential: About 1.0 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 20 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Semidesert Sand (Fourwing Saltbush)
Ecological site number: R035XY212UT
Present vegetation (in most areas): Utah juniper, Cutler Mormon tea, galleta, and Indian ricegrass
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	11
Litter (<5 mm)	29
Rock fragments	1
Bare soil	26
Cyanobacteria crust	47
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477153 meters E., 4164489 meters N., zone 12

A—0 to 1 inch (0 to 3 centimeters); yellowish red (5YR 5/6) loamy fine sand, dark reddish brown (5YR 3/4) moist; 7 percent clay; single grain; loose, nonsticky and nonplastic; many fine roots throughout; common very fine tubular pores; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bw1—1 to 13 inches (3 to 33 centimeters); yellowish red (5YR 5/8) loamy fine sand, yellowish red (5YR 4/6) moist; 8 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and common medium roots throughout; common very fine tubular pores; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; gradual wavy boundary.

Bw2—13 to 30 inches (33 to 76 centimeters); yellowish red (5YR 5/8) loamy fine sand, yellowish red (5YR 4/6) moist; 8 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots

throughout; common very fine tubular pores; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; gradual wavy boundary.

Bk1—30 to 44 inches (76 to 112 centimeters); yellowish red (5YR 5/8) loamy fine sand, yellowish red (5YR 4/6) moist; 8 percent clay; massive; soft, very friable, nonsticky and nonplastic; common fine roots throughout; common very fine tubular pores; common fine threadlike carbonate masses and common fine spherical carbonate masses; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; gradual wavy boundary.

Bk2—44 to 60 inches (112 to 152 centimeters); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; 6 percent clay; massive; loose, nonsticky and nonplastic; common fine threadlike carbonate masses and common medium spherical carbonate masses; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2.

Range in Characteristics

Reaction: pH 7.9 to 8.4 (moderately alkaline)
Depth of calcic horizon (Bk horizon): 30 to 60 inches (76 to 152 centimeters)

A horizon:
Value—5 or 6 dry; 3 to 5 moist
Chroma—4 or 6, dry or moist

Bw horizons:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—6 to 8, dry or moist
Texture—loamy fine sand or fine sand
Clay content—4 to 10 percent
Calcium carbonate equivalent—0 to 2 percent

Bk horizons:
Hue—2.5YR or 5YR
Value—4 to 7 dry; 3 to 5 moist
Chroma—3 to 8, dry or moist
Texture—loamy fine sand or fine sand
Clay content—4 to 10 percent
Calcium carbonate equivalent—5 to 15 percent

Description of the Anasazi Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids
Landform: Interfluves on hills, mesas, and structural benches
Geology: Kayenta Formation sandstone (Jurassic) and dune deposits (Quaternary)
Parent material: Eolian deposits and/or residuum weathered from sandstone
Slope: 5 to 22 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 20 to 35 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 2.6 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: B
Calcium carbonate content (maximum): About 20 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)

Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Semidesert Sandy Loam (Blackbrush)
Ecological site number: R035XY218UT
Present vegetation (in most areas): Blackbrush, galleta, Cutler Mormon tea, Indian ricegrass, and shadscale saltbush
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	40
Litter (<5 mm)	5
Rock fragments	3
Bare soil	47
Cyanobacteria crust	5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477035 meters E., 4164453 meters N., zone 12

A—0 to 1 inch (0 to 3 centimeters); reddish brown (5YR 5/4) fine sandy loam, yellowish red (5YR 4/6) moist; 8 percent clay; weak thin platy structure; loose, nonsticky and nonplastic; many very fine roots throughout; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw—1 to 8 inches (3 to 20 centimeters); reddish brown (5YR 5/4) loamy fine sand, yellowish red (5YR 4/6) moist; 7 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common medium and many very fine roots throughout; common very fine dendritic tubular pores; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.4; clear wavy boundary.

Bk1—8 to 17 inches (20 to 43 centimeters); reddish brown (5YR 5/4) loamy fine sand, yellowish red (5YR 4/6) moist; 7 percent clay; weak medium subangular blocky structure; soft, friable, nonsticky and nonplastic; common fine and many very fine roots throughout; common very fine and common fine dendritic tubular pores; common fine spherical carbonate masses; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.4; clear wavy boundary.

Bk2—17 to 29 inches (43 to 74 centimeters); reddish brown (5YR 5/4) gravelly sandy loam, yellowish red (5YR 4/6) moist; 12 percent clay; massive; hard, firm, slightly sticky and slightly plastic; common very fine roots throughout; common carbonate masses around rock fragments and common fine spherical carbonate masses; 15 percent gravel; violently effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; abrupt smooth boundary.

R—29 to 39 inches (74 to 99 centimeters); unweathered, unfractured sandstone.

Range in Characteristics

Reaction: pH 7.9 to 8.4 (moderately alkaline)
Depth of calcic horizon (Bk2 horizon): 17 to 29 inches (43 to 74 centimeters)

A horizon:
Value—5 or 6 dry; 3 to 5 moist
Chroma—4 or 6, dry or moist

Bw horizon:
Hue—2.5YR or 7.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 to 6, dry or moist

Figure 114.—An area of map unit 25 (Eslendo-Happle-Rock outcrop complex, 30 to 70 percent slopes, saline) on west-facing escarpments in Strike Valley.

Texture—fine sandy loam or loamy fine sand
Clay content—6 to 12 percent
Calcium carbonate equivalent—0 to 5 percent
Rock fragments—0 to 5 percent

Bk horizons:
Hue—2.5YR or 7.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 to 6, dry or moist
Texture—sandy loam, fine sandy loam, or loamy fine sand
Clay content—6 to 14 percent
Calcium carbonate equivalent—5 to 20 percent
Rock fragments—0 to 30 percent

25—Eslendo-Happle-Rock outcrop complex, 30 to 70 percent slopes, saline

Map Unit Setting

General setting: Strike Valley, west-facing escarpments (fig. 114)
Major land resource area: 35—Colorado Plateau
Elevation: 5,030 to 6,340 feet (1,532 to 1,931 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Eslendo, saline and similar soils: 60 percent
Happle, saline-sodic and similar soils: 20 percent
Rock outcrop, Mesaverde Formation sandstone: 15 percent
Minor components (5 percent):
Rock outcrop (Blue Gate and Emery Sandstone Members of Mancos Shale)
Badlands with no vegetation

Description of the Eslendo, Saline Soil

Note: A saline phase is assigned to this ustic aridic soil because the high electrical conductivity of the soil reduces the amount of water available for uptake by plant roots.

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 115)
Landform: Hills and escarpments (fig. 116)
Geology: Mancos Shale (Cretaceous), Masuk, Emery Sandstone, and Blue Gate Members
Parent material: Residuum weathered from shale
Slope: 30 to 70 percent, southeast to northwest aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 8 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 1.7 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Clay (Mat Saltbush)
Ecological site number: R035XY223UT
Present vegetation (in most areas): Valley saltbush, Brenda's yellow cryptantha, Jones' pepperweed, and Salina wildrye
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 117)

Plant canopy	5-15
Litter (<5 mm)	5-10
Rock fragments	25-45
Bare soil	50-65
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 495773 meters E., 4198951 meters N., zone 12

C—0 to 4.5 inches (0 to 11 centimeters); light brownish gray (2.5Y 6/2) silt loam, olive brown (2.5Y 4/3) moist; 15 percent clay; massive; slightly hard, friable, slightly

Figure 115.—Profile of the Eslendo soil in map unit 25 (Eslendo-Happle-Rock outcrop complex, 30 to 70 percent slopes, saline). Soft bedrock is at a depth of 26 centimeters. Scale is in centimeters.

sticky and slightly plastic; common very fine roots throughout; 5 percent channers; strongly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

Cyz—4.5 to 18.5 inches (11 to 47 centimeters); light brownish gray (2.5Y 6/2) parachannery silt loam, olive brown (2.5Y 4/3) moist; 20 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, and common medium roots throughout; common very fine platy gypsum masses in matrix and common very fine irregular salt masses in matrix; 20 percent parachanners; slightly effervescent; moderately alkaline, pH 8.4; gradual wavy boundary.

Cr—18.5 to 28.5 inches (47 to 72 centimeters); weakly cemented fractured shale.

Figure 116.—Landscape of the Eslendo soil in map unit 25 (Eslendo-Happle-Rock outcrop complex, 30 to 70 percent slopes, saline).

Figure 117.—Surface of the Eslendo soil in map unit 25 (Eslendo-Happle-Rock outcrop complex, 30 to 70 percent slopes, saline).

Range in Characteristics

Note: Some pedons may contain a thin A horizon

C horizons:
Value—5 or 6 dry
Chroma—2 or 3, dry or moist
Texture—clay loam, silt loam, or silty clay loam
Clay content—15 to 35 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—0 to 5 percent
SAR—0 to 5
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 15 percent channers

Description of the Happle, Saline-Sodic Soil

Note: A saline-sodic phase is assigned to this ustic aridic soil because the high electrical conductivity of the soil reduces the amount of water available for uptake by plant roots.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 118)
Landform: Escarpments (fig. 119)
Geology: Mancos Shale (Cretaceous), Masuk, Emery Sandstone, and Blue Gate Members
Parent material: Colluvium derived from sandstone
Slope: 30 to 70 percent, southeast to northwest aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 2.4 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 15 SAR (moderately sodic)
Ecological site name: Semidesert Shallow Clay (Mat Saltbush)
Ecological site number: R035XY223UT
Present vegetation (in most areas): Valley saltbush, Brenda's yellow cryptantha, Jones' pepperweed, and Salina wildrye
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	5-15
Litter (<5 mm)	5-10
Rock fragments	25-45
Bare soil	50-65
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 118.—Profile of the Happle soil in map unit 25 (Eslendo-Happle-Rock outcrop complex, 30 to 70 percent slopes, saline). Scale is in centimeters.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 495761 meters E., 4198976 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); yellowish brown (10YR 5/4) gravelly fine sandy loam, dark yellowish brown (10YR 4/4) moist; 13 percent clay; weak medium subangular blocky structure parting to moderate very fine granular; soft, very friable, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; 25 percent gravel, 5 percent cobbles, and 2 percent stones; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw—3.5 to 12 inches (9 to 30 centimeters); light olive brown (2.5Y 5/4) very gravelly fine sandy loam, olive brown (2.5Y 4/4) moist; 15 percent clay; moderate medium

Figure 119.—Landscape of the Happle soil in map unit 25 (Eslendo-Happle-Rock outcrop complex, 30 to 70 percent slopes, saline).

subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common very fine roots throughout; common very fine irregular pores; 40 percent gravel, 5 percent cobbles, and 2 percent stones; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Cn—12 to 20 inches (30 to 51 centimeters); light olive brown (2.5Y 5/4) cobbly fine sandy loam, olive brown (2.5Y 4/4) moist; 14 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; few fine and common very fine roots throughout; common very fine and common fine irregular pores; 10 percent gravel and 5 percent cobbles; slightly effervescent; strongly alkaline, pH 8.8; abrupt wavy boundary.

Cy—20 to 28.5 inches (51 to 72 centimeters); light olive brown (2.5Y 5/4) gravelly very fine sandy loam, olive brown (2.5Y 4/4) moist; 18 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots throughout; common very fine and common fine irregular pores; common medium threadlike gypsum masses in matrix; 15 percent gravel and 5 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C1—28.5 to 45.5 inches (72 to 115 centimeters); light yellowish brown (2.5Y 6/4) very stony loamy fine sand, light olive brown (2.5Y 5/4) moist; 4 percent clay; massive; soft, very friable, nonsticky and nonplastic; few very fine roots throughout; many very fine interstitial pores; 10 percent gravel, 15 percent cobbles, and 20 percent stones; noneffervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C2—45.5 to 78.5 inches (115 to 200 centimeters); light olive brown (2.5Y 5/4) gravelly fine sandy loam, olive brown (2.5Y 4/4) moist; 16 percent clay; massive; soft, very friable, slightly sticky and nonplastic; few very fine roots throughout; many

very fine interstitial pores; 20 percent gravel and 3 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:
Texture—fine sandy loam or sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—0 to 5 percent
SAR—0 to 5
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—25 to 60 percent gravel and cobbles

Bw horizon:
Texture—fine sandy loam or sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—0 to 5 percent
SAR—0 to 5
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—35 to 60 percent gravel and cobbles
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C horizons:
Value—5 or 6 dry; 4 or 5 moist
Texture—fine sandy loam, sandy loam, or loamy fine sand
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—0 to 10 percent
SAR—5 to 15
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—15 to 60 percent gravel and cobbles

This Happle soil is mapped as a taxadjunct to the Happle series because it contains a cambic horizon and averages less than 35 percent coarse fragments in the particle-size control section. The Happle series is classified as a Torriorthent with a loamy-skeletal particle-size control section.

Description of the Rock Outcrop, Mesaverde Formation Sandstone

This component is characterized by very tall, nearly continuous, nearly vertical cliffs and escarpments. The lithology is sandstone. The vertical relief ranges from several tens to several hundreds of feet. Travel by any type of wheeled vehicle is virtually impossible. Travel by foot is extremely difficult or nearly impossible and is usually hazardous. This component is a natural barrier to livestock and most other terrestrial animals. The nearly vertical areas are barren but there may be vegetation growing in cracks and crevices or in areas of colluvial deposition.

26—Foy-Whitesage families complex, 2 to 35 percent slopes

Map Unit Setting

General setting: Base of Thousand Lake Mountain and Paradise Flats area
Major land resource area: 35—Colorado Plateau
Elevation: 6,080 to 8,970 feet (1,852 to 2,735 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)

Mean annual air temperature: 44 to 46 degrees F (6.7 to 7.8 degrees C)
Mean annual soil temperature: 46 to 48 degrees F (7.8 to 8.9 degrees C)
Frost-free period: 120 to 140 days

Map Unit Composition

Foy family and similar soils: 50 percent
Whitesage family and similar soils: 45 percent
Minor components (5 percent) and their ecological sites:
Deep and very deep, clayey, saline soils in depressions on pediments; Semidesert Shallow Clay (Shadscale-Utah Juniper)

Description of the Foy Family Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau whereas the Foy series occurs in MLRA 47—Wasatch and Uintah Mountains.

Taxonomic classification: Loamy-skeletal, mixed, superactive, frigid Aridic Calciustepts (fig. 120)
Landform: Dissected mountains and plateaus
Geology: Boulder deposits and pediment deposits (Pleistocene and Upper Pliocene)
Parent material: Alluvium derived from basalt
Slope: 2 to 35 percent, north to south aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 4.3 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: A
Calcium carbonate content (maximum): About 35 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Stony Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY321UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, blue grama, and brittle pricklypear
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	15-25
Rock fragments	25-40
Bare soil	10-20
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 466951 meters E., 4250711 meters N., zone 12

Figure 120.—Profile of the Foy family soil in map unit 26 (Foy-Whitesage families complex, 2 to 35 percent slopes). Scale is in centimeters.

A—0 to 2.5 inches (0 to 6 centimeters); brown (7.5YR 5/4) stony fine sandy loam, dark brown (7.5YR 3/4) moist; 14 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine roots throughout; many very fine irregular pores; 10 percent gravel, 10 percent cobbles, and 10 percent stones; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—2.5 to 13 inches (6 to 33 centimeters); brown (7.5YR 4/4) very stony fine sandy loam, dark brown (7.5YR 3/4) moist; 16 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, few fine, common medium, and common coarse roots throughout; many very

fine irregular pores; few fine irregular carbonate masses around rock fragments and common fine irregular carbonate masses in matrix; 10 percent gravel, 15 percent cobbles, and 15 percent stones; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—13 to 21.5 inches (33 to 54 centimeters); pale brown (10YR 6/3) very stony sandy loam, brown (10YR 4/3) moist; 14 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, few fine, common medium, and common coarse roots throughout; many very fine irregular pores; common fine irregular carbonate masses around rock fragments and many medium irregular carbonate masses in matrix; 15 percent gravel, 15 percent cobbles, and 10 percent stones; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk3—21.5 to 60 inches (54 to 150 centimeters); pale brown (10YR 6/3) very stony fine sandy loam, brown (10YR 4/3) moist; 16 percent clay; weak fine subangular blocky structure; moderately hard, firm, slightly sticky and slightly plastic; few fine and few medium roots throughout; many very fine irregular pores; common fine irregular carbonate masses around rock fragments and many medium irregular carbonate masses in matrix; 20 percent gravel, 10 percent cobbles, and 20 percent stones; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Hue—7.5YR or 10YR
Value—5 or 6 dry; 2 to 4 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, loam, or clay loam
Clay content—10 to 30 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—1 to 35 percent gravel, cobbles, and stones
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bk1 horizon or Bw horizon (if it occurs):

Hue—7.5YR or 10YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, loam, or clay loam
Clay content—14 to 30 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones

Lower Bk horizons (below a depth of 50 centimeters):

Hue—7.5YR or 10YR
Value—5 to 7 dry; 3 to 6 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, loam, or clay loam
Clay content—14 to 30 percent
Calcium carbonate equivalent—10 to 35 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones

Description of the Whitesage Family Soil

Note: This soil is correlated at the family level because it contains colors yellower than 7.5YR and has silt loam and silty clay loam textures in the subsurface horizons.

The Whitesage series has hue of 7.5YR and redder and has sandier textures in the subsurface horizons.

Taxonomic classification: Fine-loamy, mixed, superactive, frigid Aridic Calciustepts
Landform: Dissected mountains and plateaus
Geology: Boulder deposits (Pleistocene and Upper Pliocene)
Parent material: Alluvium derived from basalt over residuum weathered from sandstone
Slope: 2 to 35 percent, north to southeast aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 9.7 (high)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: C
Calcium carbonate content (maximum): About 35 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Loam (Mountain Big Sagebrush)
Ecological site number: R035XY308UT
Present vegetation (in most areas): Twoneedle pinyon and Utah juniper
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	35-45
Rock fragments	15-25
Bare soil	5-15
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 465386 meters E., 4261951 meters N., zone 12

A—0 to 3 inches (0 to 7 centimeters); dark yellowish brown (10YR 4/4) gravelly fine sandy loam, very dark brown (10YR 2/2) moist; 16 percent clay; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; many fine irregular pores; 18 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw—3 to 11 inches (7 to 28 centimeters); brown (10YR 4/3) gravelly sandy clay loam, very dark grayish brown (10YR 3/2) moist; 23 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; common fine and common very fine roots throughout; common very fine irregular pores; few distinct carbonate coats on rock fragments; common fine irregular carbonate masses in matrix; 15 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; gradual wavy boundary.

Bk1—11 to 17 inches (28 to 43 centimeters); light brownish gray (2.5Y 6/2) loam, light yellowish brown (2.5Y 6/4) moist; 25 percent clay; moderate fine angular blocky

structure; slightly hard, friable, slightly sticky and very plastic; common fine and common medium roots throughout; common very fine irregular pores; few distinct carbonate coats on rock fragments; common fine irregular carbonate masses in matrix; 5 percent gravel; violently effervescent; strongly alkaline, pH 8.6; clear wavy boundary.

Bk2—17 to 35.5 inches (43 to 90 centimeters); gray (10YR 6/1) loam, gray (10YR 5/1) moist; 24 percent clay; massive; hard, firm, slightly sticky and very plastic; common fine roots throughout; common very fine irregular pores; few distinct carbonate coats on rock fragments; many fine irregular carbonate masses in matrix; 5 percent gravel; violently effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

2C—35.5 to 60 inches (90 to 153 centimeters); brown (7.5YR 5/4) gravelly silty clay loam, strong brown (7.5YR 4/6) moist; 32 percent clay; massive; hard, firm, moderately sticky and very plastic; few distinct pressure faces; common fine irregular carbonate masses in matrix; 15 percent gravel; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:

Value—4 to 6 dry; 2 to 4 moist
Chroma—3 or 4 dry; 2 to 4 moist
Texture—fine sandy loam or loam
Clay content—15 to 28 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—1 to 25 percent gravel

Bw horizon:

Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 to 4 moist
Chroma—3 or 4 dry; 2 to 6 moist
Texture—loam or sandy clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—1 to 25 percent gravel

Bk1 horizon:

Hue—7.5YR or 10YR
Value—4 to 6 dry; 3 or 4 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—loam, sandy clay loam, clay loam, silt loam, or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—5 to 35 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—1 to 25 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bk2 horizon:

Hue—7.5YR, 10YR, or 2.5Y
Value—5 to 7 dry; 4 to 6 moist
Chroma—1 to 4 dry; 1 to 3 moist
Texture—loam, sandy clay loam, clay loam, silt loam, or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—10 to 35 percent

Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—1 to 25 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C or 2C horizons:
Hue—7.5YR, 10YR, or 2.5Y
Chroma—4 or 6, dry or moist
Texture—loam, sandy clay loam, clay loam, silt loam, or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—5 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—1 to 25 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

27—Gladel-Plumasano complex, 2 to 20 percent slopes

Map Unit Setting

General setting: Dry Bench
Major land resource area: 35—Colorado Plateau
Elevation: 6,540 to 7,420 feet (1,992 to 2,261 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 44 to 46 degrees F (6.7 to 7.8 degrees C)
Mean annual soil temperature: 46 to 48 degrees F (7.8 to 8.9 degrees C)
Frost-free period: 120 to 140 days

Map Unit Composition

Gladel and similar soils: 55 percent
Plumasano and similar soils: 35 percent
Minor components (10 percent):
Rock outcrop (Kayenta Formation sandstone)

Description of the Gladel Soil

Taxonomic classification: Loamy, mixed, superactive, mesic Aridic Lithic Haplustepts (fig. 121)
Landform: Mesas (fig. 122)
Geology: Kayenta Formation sandstone (Triassic)
Parent material: Residuum weathered from sandstone and/or slope alluvium derived from sandstone
Slope: 2 to 20 percent, south to southeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 10 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.3 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Shallow Loam (Pinyon-Utah Juniper)

Figure 121.—Profile of the Gladel soil in map unit 27 (Gladel-Plumasano complex, 2 to 20 percent slopes). Bedrock is at a depth of 52 centimeters. Scale is in centimeters.

Ecological site number: R035XY315UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, alderleaf mountain mahogany, Utah serviceberry, and desert snowberry
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	45-55
Litter (<5 mm)	20-30
Rock fragments	5-10
Bare soil	10-20
Cyanobacteria crust	2-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 484250 meters E., 4208623 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; 12 percent clay; weak medium subangular blocky structure; soft, very

friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; many very fine interstitial and many fine irregular pores; noneffervescent; neutral, pH 7.2; abrupt smooth boundary.

Bw—4 to 10.5 inches (10 to 27 centimeters); light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 4/4) moist; 9 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine, common fine, common medium, and common coarse roots throughout; many very fine and many fine irregular pores; 5 percent cobbles; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

R—10.5 to 20.5 inches (27 to 52 centimeters); indurated, fractured sandstone; common fine, common medium, and common coarse roots at top of horizon.

Range in Characteristics

A horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 3 or 4 moist
Texture—sandy loam or fine sandy loam
Clay content—7 to 18 percent
Calcium carbonate equivalent—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or channers
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

Bw horizon:

Hue—5YR to 10YR
Value—5 to 7 dry; 3 to 5 moist

Figure 122.—The Gladel soil in map unit 27 (Gladel-Plumasano complex, 2 to 20 percent slopes) on mesas. This map unit is on Dry Bench.

Figure 123.—Profile of the Plumasano soil in map unit 27 (Gladel-Plumasano complex, 2 to 20 percent slopes). Scale is in centimeters.

Chroma—4 or 6, dry or moist
Clay content—7 to 18 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or channers
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Plumasano Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Aridic Haplustepts (fig. 123)
Landform: Sand sheets on mesas (fig. 124)
Geology: Eolian deposits (Holocene and Upper Pliestocene) and alluvial deposits (Holocene)
Parent material: Slope alluvium derived from sandstone and/or eolian sands derived from sandstone
Slope: 2 to 9 percent, west to east aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat excessively drained

Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 9.3 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Loam (Mountain Big Sagebrush)
Ecological site number: R035XY308UT
Present vegetation (in most areas): Twoneedle pinyon, mountain big sagebrush, blue grama, needle and thread, Utah juniper, and Great Basin lupine
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	35-50
Litter (<5 mm)	20-35
Rock fragments	0-2
Bare soil	15-30
Cyanobacteria crust	0-15
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 124.—The Plumasano soil in map unit 27 (Gladel-Plumasano complex, 2 to 20 percent slopes) on sands sheets on mesas.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 485275 meters E., 4207927 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) moist; 11 percent clay; weak very fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular and many very fine interstitial pores; noneffervescent; neutral, pH 7.2; clear smooth boundary.

AB—3.5 to 11 inches (9 to 28 centimeters); strong brown (7.5YR 4/6) fine sandy loam, dark brown (7.5YR 3/4) moist; 10 percent clay; moderate medium subangular blocky structure; moderately hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine and many fine irregular pores; noneffervescent; slightly alkaline, pH 7.4; clear smooth boundary.

Bw—11 to 41.5 inches (28 to 105 centimeters); red (2.5YR 5/6) fine sandy loam, reddish brown (2.5YR 4/4) moist; 9 percent clay; weak medium subangular blocky structure; very hard, extremely firm, slightly sticky and nonplastic; few very fine, few fine, and few medium roots throughout; common very fine irregular pores; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Bk—41.5 to 77.5 inches (105 to 197 centimeters); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; 7 percent clay; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and common fine irregular pores; common fine irregular carbonate masses in matrix; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Hue—5YR or 7.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

AB horizon:

Hue—5YR or 7.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

Bw horizon:

Hue—2.5YR, 5YR, or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 to 6 dry; 4 or 6 moist
Texture—sandy loam or fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—0 to 10 percent

Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

Bk horizon:
Hue—2.5YR, 5YR, or 7.5YR
Value—5 to 7 dry; 3 to 5 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—6 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

28—Goblin fine sandy loam, 15 to 70 percent slopes

Map Unit Setting

General setting: South Desert
Major land resource area: 35—Colorado Plateau
Elevation: 5,040 to 6,530 feet (1,536 to 1,990 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Goblin and similar soils: 80 percent
Minor components (20 percent) and their ecological sites:
Rock outcrop, Carmel Formation
Shallow gypseous soils with gypsic horizons on hills; Desert Gypsum Loam (Torrey's Jointfir)
Gypsum land with no vegetation
Moenkopie soils on hills and scarp slopes of cuestas (shallow, loamy soils); Desert Shallow Sandy Loam (Shadscale)

Description of the Goblin Soil

Taxonomic classification: Loamy, mixed, superactive, mesic, shallow Leptic Haplogypsids (fig. 125)
Landform: Dip slopes of cuestas (fig. 126)
Geology: Carmel Formation (Jurassic)
Parent material: Residuum weathered from rock gypsum
Slope: 15 to 70 percent, northeast to south aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 20 inches; lithic bedrock at a depth of 10 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.0 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D

Figure 125.—Profile of the Goblin soil in map unit 28 (Goblin fine sandy loam, 15 to 70 percent slopes). The light color of the soil is due to the high gypsum content. Scale is in centimeters.

Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Very Shallow Gypsum (Torrey's Jointfir)
Ecological site number: R035XY142UT
Present vegetation (in most areas): Torrey's jointfir, Bigelow sage, low rabbitbrush, prickly Russian thistle, shadscale, and Indian ricegrass
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 127)

Plant canopy	5-20
Litter (<5 mm)	5-15
Rock fragments	5-30
Bare soil	40-50
Cyanobacteria crust	5-20
Lichen crust	0-5
Moss crust	0

Figure 126.—The Goblin soil in map unit 28 (Goblin fine sandy loam, 15 to 70 percent slopes) on dip slopes of cuestas.

Figure 127.—Typical surface of the Goblin soil in map unit 28 (Goblin fine sandy loam, 15 to 70 percent slopes).

Salt crust	0
Gypsum crust	0-5

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 487060 meters E., 4236651 meters N., zone 12

AC—0 to 2.5 inches (0 to 6 centimeters); reddish yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 5/6) moist; 12 percent clay; weak medium platy structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; common fine irregular pores; many fine irregular gypsum crystals in matrix; slightly effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Cy—2.5 to 8.5 inches (6 to 22 centimeters); reddish yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 5/6) moist; 11 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; common fine irregular pores; many fine irregular gypsum crystals in matrix; very slightly effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Cr—8.5 to 15.5 inches (22 to 40 centimeters); moderately cemented gypsum.

R—15.5 to 25.5 inches (40 to 65 centimeters); very strongly cemented gypsum.

Range in Characteristics

AC horizon:

Hue—5YR or 7.5YR
Value—6 to 8 dry; 5 or 6 moist
Chroma—2 to 6 dry; 4 or 6 moist
Texture—sandy loam, fine sandy loam, or very fine sandy loam
Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—5 to 10 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Cy horizon:

Hue—5YR, 7.5YR, or 10YR
Value—6 to 8 dry; 5 or 6 moist
Chroma—2 to 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—5 to 10 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—none

This Goblin soil is mapped as a taxadjunct to the Goblin series because it has mixed mineralogy with less than 15 percent gypsum in the particle-size control section whereas the Goblin series has gypsic mineralogy.

29—Goblin-Clapper complex, 8 to 65 percent slopes

Map Unit Setting

General setting: Cathedral Valley where it joins the survey area of Emery County along the northern boundary of Capitol Reef National Park
Major land resource area: 35—Colorado Plateau
Elevation: 5,720 to 6,800 feet (1,744 to 2,073 meters)

Mean annual precipitation: 8 to 10 inches (203 to 254 millimeters)
Mean annual air temperature: 48 to 52 degrees F (8.9 to 11.0 degrees C)
Mean annual soil temperature: 50 to 54 degrees F (10.0 to 12.1 degrees C)
Frost-free period: 130 to 160 days

Map Unit Composition

Goblin and similar soils: 50 percent
Clapper and similar soils: 30 percent
Minor components (20 percent) and their ecological sites:
Badland with no vegetation
Very deep, sandy soils on dunes on stream terraces; Sandy Bottom (Fourwing Saltbush)

Description of the Goblin Soil

Taxonomic classification: Loamy, gypsic, mesic, shallow Leptic Haplogypsids
Landform: Dissected hillslopes and structural benches
Geology: Curtis and Entrada Formations sandstone and siltstone (Jurassic)
Parent material: Gypsiferous residuum weathered from sandstone and shale
Slope: 8 to 60 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 5 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 1.3 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 25 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 4 SAR (slightly sodic)
Ecological site name: Desert Very Shallow Gypsum (Torrey's Jointfir)
Ecological site number: R035XY142UT
Present vegetation (in most areas): Torrey's jointfir, shadscale, galleta, Indian ricegrass, and matted crinklemat
Land capability classification (nonirrigated areas): 7s

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477480 meters E., 4261470 meters N., zone 12

A—0 to 3 inches (0 to 8 centimeters); strong brown (7.5YR 5/6) very parachannery silty clay loam, strong brown (7.5YR 4/6) moist; 30 percent clay; weak thin platy and weak fine granular structure; slightly hard, friable, slightly sticky and moderately plastic; few very fine roots throughout; many fine irregular pores; 50 percent parachanners; strongly effervescent, by HCl, 1 normal; strongly alkaline, pH 8.6; abrupt wavy boundary.

By—3 to 15 inches (8 to 38 centimeters); brown (7.5YR 5/4) extremely parachannery silty clay loam, brown (7.5YR 4/4) moist; 32 percent clay; massive; slightly hard, friable, slightly sticky and moderately plastic; few fine and few very fine roots throughout; common fine irregular pores; common fine irregular gypsum crystals and common coarse platy gypsum masses; 70 percent parachanners; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.4; abrupt wavy boundary.

Cr—15 to 25 inches (38 to 63 centimeters); moderately cemented gypsiferous shale and siltstone.

Range in Characteristics

A horizon:
Hue—2.5YR, 5YR, or 7.5YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—silty clay loam or silt loam
Clay content—18 to 32 percent
Gypsum content—15 to 25 percent
Rock fragments—0 to 35 percent gravel or channers and 0 to 50 percent parachanners

Cy horizon:
Hue—2.5YR, 5YR, or 7.5YR
Value—5 to 8 dry; 4 or 5 moist
Chroma—2 to 6, dry or moist
Texture—silty clay loam or silt loam
Clay content—18 to 32 percent
Gypsum content—20 to 30 percent
Rock fragments—0 to 35 percent gravel or channers and 0 to 70 percent parachanners

This Goblin soil differs from the Goblin series in that it has 18 to 32 percent clay in the particle-size control section whereas the Goblin series has 8 to 18 percent clay. This difference does not have a major effect on the interpretations for this soil because the shallow gypsic horizon and shallow bedrock are the main factors determining the interpretations.

Description of the Clapper Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocambids
Landform: Dissected structural benches and hills
Geology: Curtis and Entrada Formations sandstone and siltstone (Jurassic)
Parent material: Colluvium derived from basalt and slope alluvium derived from sandstone and shale over residuum weathered from sandstone and shale
Slope: 25 to 65 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 40 to 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 4.1 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 4 SAR (slightly sodic)
Ecological site name: Semidesert Very Steep Stony Loam (Salina Wildrye)
Ecological site number: R035XY260UT

Present vegetation (in most areas): Indian ricegrass, shadscale, Salina wildrye, Torrey's jointfir, Bigelow sagebrush, and gooseberryleaf globemallow
Land capability classification (nonirrigated areas): 7e

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477890 meters E., 4262988 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); brown (7.5YR 5/4) very cobbly fine sandy loam, brown (7.5YR 4/3) moist; 8 percent clay; weak thick platy structure parting to weak fine subangular blocky; slightly hard, very friable, slightly sticky and nonplastic; common very fine, few fine and medium, and few coarse roots; common very fine tubular and common very fine interstitial pores; carbonate, finely disseminated; 15 percent gravel, 35 percent cobbles, 3 percent stones, and 5 percent channers; very slightly effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

Bw—2 to 23.5 inches (5 to 60 centimeters); light brown (7.5YR 6/4) very cobbly fine sandy loam, brown (7.5YR 4/4) moist; 9 percent clay; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine, few fine and medium, and few coarse roots; many very fine and few fine tubular pores; carbonate coats on bottom surfaces of rock fragments; carbonate, finely disseminated in matrix; 15 percent gravel, 25 percent cobbles, 3 percent stones, and 10 percent channers; strongly effervescent; moderately alkaline, pH 7.9; abrupt wavy boundary.

C1—23.5 to 32.5 inches (60 to 82 centimeters); pink (7.5YR 7/3) gravelly fine sandy loam, brown (7.5YR 5/4) moist; 7 percent clay; single grain; slightly hard, very friable, slightly sticky and nonplastic; common very fine and few fine and medium roots; many very fine tubular pores; carbonate coats on bottom surfaces of rock fragments; carbonate that is finely disseminated in matrix and many threadlike carbonate masses; 15 percent gravel, 5 percent cobbles, 3 percent stones, and 5 percent channers; strongly effervescent; moderately alkaline, pH 8.1; clear wavy boundary.

C2—32.5 to 44 inches (82 to 112 centimeters); light brown (7.5YR 6/3) gravelly fine sandy loam, brown (7.5YR 4/3) moist; 10 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine tubular pores; carbonate, finely disseminated; 20 percent gravel, 2 percent cobbles, and 10 percent channers; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

R—44 inches (112 centimeters); very strongly cemented sandstone.

Range in Characteristics

Clay content: Average of less than 18 percent
Rock fragment content: Average of 35 to 60 percent

A horizon:
Hue—7.5YR or 10YR
Value—5 or 6 dry; 3 to 5 moist
Chroma—2 to 6, dry or moist
Rock fragments—20 to 70 percent
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bw and C horizons:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—2 to 5, dry or moist
Texture—sandy clay loam, loam, sandy loam, or fine sandy loam

Rock fragments—30 to 60 percent
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Clapper soil is mapped as a taxadjunct to the Clapper series because it does not have a calcic horizon, typically has less than 18 percent clay, and is deep to bedrock. The Clapper series has a calcic horizon, has 18 to 27 percent clay, and is very deep.

30—Goblin-Ivanpatch complex, 2 to 60 percent slopes

Map Unit Setting

General setting: South Desert
Major land resource area: 35—Colorado Plateau
Elevation: 4,990 to 5,690 feet (1,521 to 1,735 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Goblin and similar soils: 60 percent
Ivanpatch and similar soils: 30 percent
Minor components (10 percent) and their ecological sites:
Rock outcrop (Entrada Sandstone)
Riverwash in channels with no vegetation
Shallow, loamy soils lacking an accumulation of secondary gypsum on hillslopes; Desert Very Shallow Gypsum (Torrey's Jointfir)

Description of the Goblin Soil

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Haplogypsids
Landform: Hillslopes on cuestas and breaks (fig. 128)
Geology: Carmel and Entrada Formations (Jurassic)
Parent material: Colluvium derived from sandstone over residuum weathered from sandstone
Slope: 9 to 60 percent, northeast to southeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.0 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 10 SAR (slightly sodic)
Ecological site name: Desert Very Shallow Gypsum (Torrey's Jointfir)
Ecological site number: R035XY142UT
Present vegetation (in most areas): Crispleaf buckwheat, Indian ricegrass, Torrey's jointfir, nakedstem sunray, and galleta
Land capability classification (nonirrigated areas): 7e

Figure 128.—The Goblin soil in map unit 30 (Goblin-Ivanpatch complex, 2 to 60 percent slopes) on hillslopes.

Ground cover (percent):

Plant canopy	5-10
Litter (<5 mm)	0-5
Rock fragments	5-10
Bare soil	80-90
Cyanobacteria crust	0
Lichen crust	0-5
Moss crust	0
Salt crust	0
Gypsum crust	0-10

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 487550 meters E., 4235679 meters N., zone 12

Cy—0 to 7.5 inches (0 to 19 centimeters); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6) moist; 11 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; many very fine irregular pores; many fine irregular gypsum crystals in matrix and many coarse irregular gypsum masses in matrix; 5 percent gravel; slightly effervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

R—7.5 to 17.5 inches (19 to 44 centimeters); very strongly cemented gypsum.

Range in Characteristics

Cy horizon:

Hue—2.5YR or 5YR
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam

Figure 129.—Profile of the Ivanpatch soil in map unit 30 (Goblin-Ivanpatch complex, 2 to 60 percent slopes). Scale is in centimeters.

Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—10 to 15 percent
Rock fragments—0 to 15 percent channers
Electrical conductivity—2 to 4 mmhos/cm
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Goblin soil is mapped as a taxadjunct to the Goblin series because it has a lithic contact within a depth of 50 centimeters and has mixed mineralogy. The Goblin series is shallow to a paralithic contact and has gypsic mineralogy.

Description of the Ivanpatch Soil

Taxonomic classification: Sandy, mixed, mesic Leptic Haplogypsids (fig. 129)
Landform: Hillslopes on cuestas and pediments (fig. 130)
Geology: Carmel and Entrada Formations (Jurassic)
Parent material: Eolian deposits derived from sandstone and/or pedisediment derived from sandstone over residuum weathered from rock gypsum
Slope: 2 to 15 percent, northeast to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 3.7 (low)

Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 2 SAR (slightly sodic)
Ecological site name: Desert Gypsum Loam (Torrey's Jointfir)
Ecological site number: R035XY106UT
Present vegetation (in most areas): Indian ricegrass, Torrey's jointfir, galleta, valley saltbush, broom snakeweed, and shadscale
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	10-20
Litter (<5 mm)	0-5
Rock fragments	0-5
Bare soil	75-85
Cyanobacteria crust	0
Lichen crust	0-5
Moss crust	0
Salt crust	0
Gypsum crust	0-10

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 487320 meters E., 4238166 meters N., zone 12

Figure 130.—Landscape of the Ivanpatch soil in map unit 30 (Goblin-Ivanpatch complex, 2 to 60 percent slopes).

A—0 to 5 inches (0 to 13 centimeters); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 5/4) moist; 7 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; common very fine interstitial pores; common very fine irregular gypsum crystals in matrix; strongly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

By—5 to 17 inches (13 to 43 centimeters); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; 6 percent clay; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; common very fine interstitial pores; common very fine irregular gypsum crystals in matrix; strongly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

Cy—17 to 69.5 inches (43 to 177 centimeters); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; 8 percent clay; single grain; soft, very friable, nonsticky and nonplastic; common fine roots throughout; common very fine interstitial pores; common very fine irregular gypsum crystals in matrix; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:

Hue—5YR or 7.5YR
Value—5 to 7, dry or moist
Chroma—3 or 4, dry or moist
Texture—sandy loam or loamy fine sand
Clay content—5 to 12 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—0 to 20 percent
Rock fragments—0 to 15 percent channers
Electrical conductivity—0 to 2 mmhos/cm
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

By horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 or 4 dry; 4 or 6 moist
Texture—fine sandy loam or loamy fine sand
Clay content—5 to 12 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—5 to 20 percent
Rock fragments—0 to 15 percent channers
Electrical conductivity—4 to 16 mmhos/cm
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Cy horizon:

Value—5 to 7 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—fine sandy loam or loamy fine sand
Clay content—5 to 12 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—5 to 20 percent
Rock fragments—0 to 15 percent channers or gravel
Electrical conductivity—8 to 16 mmhos/cm
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Ivanpatch soil is mapped as a taxadjunct to the Ivanpatch series because it has a sandy particle-size class whereas the Ivanpatch series is coarse-loamy.

Figure 131.—Landscape of map unit 31 (Hanksville, saline-sodic-Chipeta, saline complex, 9 to 45 percent slopes). This map unit is on pediments and hillslopes in Strike Valley.

31—Hanksville, saline-sodic-Chipeta, saline complex, 9 to 45 percent slopes

Map Unit Setting

General setting: Strike Valley (fig. 131)
Major land resource area: 35—Colorado Plateau
Elevation: 4,920 to 5,100 feet (1,499 to 1,556 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 181 days

Map Unit Composition

Hanksville, saline-sodic and similar soils: 60 percent
Chipeta, saline and similar soils: 30 percent
Minor components (10 percent) and their ecological sites:
- Rock outcrop (Ferron Sandstone and Blue Gate Members of Mancos Shale)
- Shallow, loamy soils on hillslopes and cuestas; Desert Shallow Clay (Shadscale)
- Very deep, fine-loamy soils on dip slopes of cuestas; Desert Loam (Shadscale)
- Rizno soils on hogbacks (shallow, loamy soils); Semidesert Shallow Loam (Utah Juniper-Pinyon)

Description of the Hanksville, Saline-Sodic Soil

Taxonomic classification: Fine-silty, mixed, active, mesic Typic Haplosalids (fig. 132)
Landform: Pediments and hillslopes on cuestas (fig. 133)
Geology: Mancos Shale (Cretaceous)
Parent material: Slope alluvium derived from shale over residuum weathered from shale

Figure 132.—Profile of the Hanksville soil in map unit 31 (Hanksville, saline-sodic-Chipeta, saline complex, 9 to 45 percent slopes). Scale is in centimeters.

Slope: 15 to 45 percent, southeast to northwest aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 40 to 80 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 2.6 (low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: C
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 40 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Desert Clay (Castle Valley Saltbush)
Ecological site number: R035XY103UT
Present vegetation (in most areas): Mat saltbush, desert trumpet, and Indian ricegrass
Land capability classification (nonirrigated areas): 7e
Ground cover (percent): (fig. 134)

Plant canopy	20-30
Litter (<5 mm)	5-10

Figure 133.—The Hanksville soil in map unit 31 (Hanksville, saline-sodic-Chipeta, saline complex, 9 to 45 percent slopes) on hillslopes.

Figure 134.—Typical surface of the Hanksville soil map unit 31 (Hanksville, saline-sodic-Chipeta, saline complex, 9 to 45 percent slopes).

Rock fragments	5-10
Bare soil	50-65
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 502352 meters E., 4187887 meters N., zone 12

A—0 to 3 inches (0 to 7 centimeters); grayish brown (2.5Y 5/2) silt loam, olive brown (2.5Y 4/4) moist; 24 percent clay; moderate medium subangular blocky structure; soft, very friable, slightly sticky and moderately plastic; common very fine roots throughout; common very fine vesicular pores; 3 percent channers; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Byz1—3 to 11 inches (7 to 28 centimeters); grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; 25 percent clay; moderate fine subangular blocky structure; soft, very friable, slightly sticky and moderately plastic; common very fine roots throughout; common very fine irregular pores; common fine irregular salt masses in matrix and common medium irregular gypsum crystals in matrix; 1 percent channers; noneffervescent; strongly alkaline, pH 8.8; gradual smooth boundary.

Byz2—11 to 37.5 inches (28 to 95 centimeters); brown (10YR 5/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; 34 percent clay; moderate fine subangular blocky structure; soft, very friable, slightly sticky and moderately plastic; common very fine roots throughout; common very fine irregular pores; common fine irregular salt masses in matrix and common fine irregular gypsum crystals in matrix; noneffervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Cyz—37.5 to 44 inches (95 to 112 centimeters); brown (10YR 5/3) silty clay loam, very dark brown (10YR 2/2) moist; 35 percent clay; massive; hard, friable, slightly sticky and moderately plastic; common fine irregular salt masses in matrix and common fine irregular gypsum crystals in matrix; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Cr—44 to 54 inches (112 to 137 centimeters); weathered, moderately cemented shale.

Range in Characteristics

A horizon:

Hue—2.5Y or 10YR
Value—3 to 6 dry; 2 to 5 moist
Chroma—1 to 3 dry; 2 to 4 moist
Texture—silt loam or loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—1 to 4 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 5 percent gravel or channers

Byz and Cyz horizons:

Hue—2.5Y or 10YR
Value—5 or 6 dry; 3 to 5 moist
Chroma—2 or 3 dry; 2 to 4 moist
Texture—silt loam or silty clay loam
Clay content—25 to 35 percent

Figure 135.—Profile of the Chipeta soil in map unit 31 (Hanksville, saline-sodic-Chipeta, saline complex, 9 to 45 percent slopes). Bedrock is at a depth of 39 centimeters. Scale is in centimeters.

Calcium carbonate equivalent—1 to 5 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—16 to 40 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Hanksville soil is mapped as a taxadjunct to the Hanksville series because it contains a salic horizon, is classified as a Typic Haplosalid, and has a fine-silty particle-size class. The Hanksville series is classified as a Typic Torriorthent and has a fine particle-size class. Also, the Hanksville soil in this map unit is deep or very deep to a paralithic contact and has electrical conductivities up to 40 mmhos/cm in the subsurface horizons whereas the Hanksville series is moderately deep to a paralithic contact and has electrical conductivities up to 16 mmhos/cm.

Description of the Chipeta, Saline Soil

Taxonomic classification: Clayey, mixed, active, calcareous, mesic, shallow Typic Torriorthents (fig. 135)
Landform: Pediments and hillslopes on cuestas
Geology: Mancos Shale (Cretaceous)
Parent material: Slope alluvium derived from shale over residuum weathered from shale
Slope: 9 to 45 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 1.7 (very low)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None

Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Shallow Clay (Mat Saltbush)
Ecological site number: R035XY124UT
Present vegetation (in most areas): Mat saltbush, desert trumpet, and Indian ricegrass
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	15-20
Litter (<5 mm)	5-10
Rock fragments	5-10
Bare soil	60-75
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 502391 meters E., 4188045 meters N., zone 12

Ay—0 to 4 inches (0 to 10 centimeters); light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; 25 percent clay; weak very thick platy structure; slightly hard, friable, moderately sticky and moderately plastic; common fine roots throughout; common very fine irregular pores; common very fine irregular gypsum crystals in matrix; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Cyz—4 to 15.5 inches (10 to 39 centimeters); grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; 36 percent clay; moderate fine platy structure; hard, very firm, very sticky and very plastic; common fine roots throughout; common very fine irregular pores; common very fine irregular salt masses in matrix and common very fine irregular gypsum crystals in matrix; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Cr—15.5 to 25 inches (39 to 64 centimeters); weathered, moderately cemented shale.

Range in Characteristics

Clay content in the particle-size control section: Average of more than 35 percent

Ay horizon:
Clay content—18 to 27 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—1 to 4 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 10 percent gravel or channers

Cyz horizon:
Clay content—30 to 40 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—1 to 4 percent
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 35 percent paragravel or parachanners

Figure 136.—Landscape of map unit 32 (Hanksville-Notal complex, 2 to 8 percent slopes, saline-sodic). This map unit is on North Blue Flats.

32—Hanksville-Notal complex, 2 to 8 percent slopes, saline-sodic

Map Unit Setting

General setting: North Blue Flats (fig. 136)
Major land resource area: 35—Colorado Plateau
Elevation: 5,050 to 5,270 feet (1,539 to 1,606 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Hanksville, saline-sodic and similar soils: 50 percent
Notal, saline-sodic and similar soils: 40 percent
Minor components (10 percent) and their ecological sites:
Very deep, sandy soils on stream terraces; Sandy Bottom (Fourwing Saltbush)

Description of the Hanksville, Saline-Sodic Soil

Taxonomic classification: Fine-silty, mixed, active, mesic Typic Haplosalids (fig. 137)
Landform: Pediments and alluvial flats
Geology: Mancos Shale (Cretaceous), Tununk Member
Parent material: Pedisediment derived from shale and/or residuum weathered from shale
Slope: 2 to 8 percent, east to south aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained

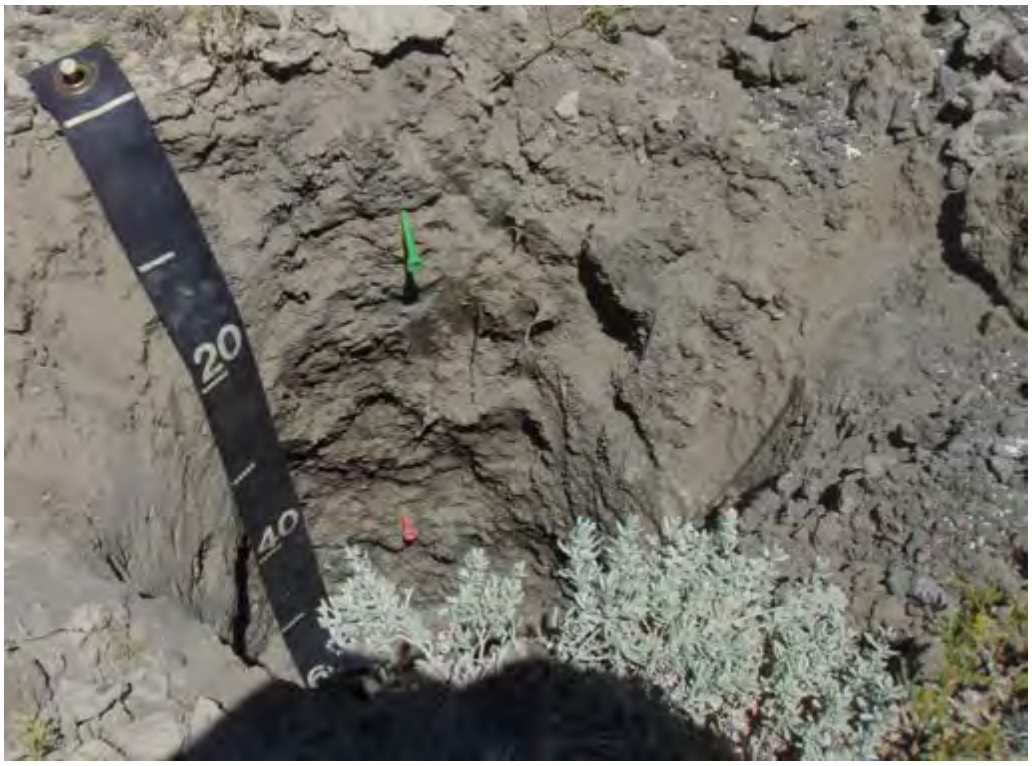

Figure 137.—Profile of the Hanksville soil in map unit 32 (Hanksville-Notal complex, 2 to 8 percent slopes, saline-sodic). Bedrock is at a depth of 63 centimeters. Scale is in centimeters.

Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: C
Calcium carbonate content (maximum): About 30 percent
Salinity maximum: About 60 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Desert Clay (Castle Valley Saltbush)
Ecological site number: R035XY103UT
Present vegetation (in most areas): Mat saltbush, yellow beeplant, and desert trumpet
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	15-25
Litter (<5 mm)	2-10
Rock fragments	0
Bare soil	70-80
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 488260 meters E., 4241310 meters N., zone 12

A—0 to 1.5 inches (0 to 4 centimeters); light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; 22 percent clay; moderate medium platy structure; moderately hard, friable, nonsticky and moderately plastic; common very fine roots throughout; common very fine vesicular pores; carbonate, finely disseminated throughout; 3 percent channers; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Byz1—1.5 to 6 inches (4 to 15 centimeters); grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; 29 percent clay; moderate medium subangular blocky structure; hard, firm, slightly sticky and moderately plastic; common fine and common very fine roots throughout; common very fine irregular pores; carbonate that is finely disseminated throughout, common fine irregular gypsum masses in matrix, and few fine irregular salt masses in matrix; strongly effervescent; strongly alkaline, pH 8.8; gradual wavy boundary.

Byz2—6 to 17.5 inches (15 to 44 centimeters); grayish brown (2.5Y 5/2) parachannery silty clay loam, dark grayish brown (2.5Y 4/2) moist; 32 percent clay; moderate coarse subangular blocky structure; hard, firm, slightly sticky and moderately plastic; common very fine roots throughout; common very fine irregular pores; carbonate that is finely disseminated throughout, common fine irregular gypsum masses in matrix, and common fine irregular salt masses in matrix; 15 percent parachanners; strongly effervescent; strongly alkaline, pH 8.8; gradual wavy boundary.

Cyz—17.5 to 25 inches (44 to 63 centimeters); grayish brown (2.5Y 5/2) extremely parachannery silt loam, olive brown (2.5Y 4/3) moist; 23 percent clay; massive; hard, firm, slightly sticky and moderately plastic; common fine roots throughout; carbonate that is finely disseminated throughout, common fine irregular gypsum masses in matrix, and common fine irregular salt masses in matrix; 60 percent parachanners; strongly effervescent; strongly alkaline, pH 8.8; gradual wavy boundary.

Cr—25 to 34.5 inches (63 to 88 centimeters); weathered, moderately cemented shale.

Range in Characteristics

A horizon:

Value—6 or 7, dry or moist
Chroma—2 or 3, dry or moist
Clay content—20 to 27 percent
Calcium carbonate equivalent—20 to 30 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 5 percent channers

Byz horizons:

Value—4 or 5, dry or moist
Clay content—27 to 35 percent
Calcium carbonate equivalent—20 to 30 percent
Gypsum content—1 to 10 percent
SAR—10 to 20
Electrical conductivity—generally 16 to 40 mmhos/cm but more than 30 mmhos/cm in some part of horizon
Rock fragments—0 to 15 percent parachanners

Cyz horizon:

Value—4 or 5 dry; 3 or 4 moist

Clay content—20 to 27 percent
Calcium carbonate equivalent—20 to 30 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—40 to 60 mmhos/cm
Rock fragments—50 to 65 percent parachanners

This Hanksville soil is mapped as a taxadjunct to the Hanksville series because it contains a salic horizon, is classified as a Typic Haplosalid, and has a fine-silty particle-size class. The Hanksville series is classified as a Typic Torriorthent and has a fine particle-size class. Also, the Hanksville soil in this map unit has electrical conductivities up to 60 mmhos/cm in the subsurface horizons whereas the Hanksville series has electrical conductivities up to 16 mmhos/cm.

Description of the Notal, Saline-Sodic Soil

Taxonomic classification: Fine-loamy, mixed, active, calcareous, mesic Typic Torriorthents (fig. 138)
Landform: Pediments and alluvial flats
Geology: Mancos Shale (Cretaceous), Tununk Member
Parent material: Pedisediment derived from shale and/or residuum weathered from shale
Slope: 2 to 8 percent, east to south aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 60 to 70 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 3.2 (low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: B
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 30 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Desert Clay (Castle Valley Saltbush)
Ecological site number: R035XY103UT
Present vegetation (in most areas): Mat saltbush, yellow beeplant, and desert trumpet
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	15-25
Litter (<5 mm)	2-10
Rock fragments	0
Bare soil	70-80
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 488640 meters E., 4241522 meters N., zone 12

Figure 138.—Profile of the Notal soil in map unit 32 (Hanksville-Notal complex, 2 to 8 percent slopes, saline-sodic). Scale is in centimeters.

A—0 to 3 inches (0 to 8 centimeters); very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; 10 percent clay; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; common fine roots throughout; common fine vesicular pores; carbonate, finely disseminated throughout; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—3 to 10 inches (8 to 26 centimeters); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; 12 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots throughout; common fine irregular pores; carbonate, finely disseminated throughout; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Cnyz1—10 to 47.5 inches (26 to 121 centimeters); grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; 24 percent clay; massive; slightly hard,

friable, slightly sticky and moderately plastic; common very fine roots throughout; common fine irregular pores; common fine irregular gypsum masses in matrix and common fine irregular salt masses in matrix; 10 percent channers; strongly effervescent; strongly alkaline, pH 9.0; gradual smooth boundary.

Cnyz2—47.5 to 60 inches (121 to 152 centimeters); grayish brown (2.5Y 5/2) very parachannery silt loam, very dark grayish brown (2.5Y 3/2) moist; 25 percent clay; massive; slightly hard, friable, slightly sticky and moderately plastic; common fine roots throughout; common fine irregular pores; common fine irregular gypsum masses in matrix and common fine irregular salt masses in matrix; 40 percent parachanners; strongly effervescent; strongly alkaline, pH 9.0; gradual smooth boundary.

Cr—60 to 69.5 inches (152 to 177 centimeters); weakly cemented shale.

Range in Characteristics

A horizon:

Value—6 or 7 dry; 5 or 6 moist
Clay content—10 to 15 percent
Calcium carbonate equivalent—5 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Bw horizon:

Hue—10YR or 7.5YR
Chroma—3 or 4, dry or moist
Clay content—12 to 18 percent
Calcium carbonate equivalent—5 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Cnyz horizons:

Value—3 or 4 moist
Chroma—2 or 3, dry or moist
Clay content—20 to 27 percent
Calcium carbonate equivalent—10 to 15 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—16 to 30 mmhos/cm
Rock fragments—10 to 40 percent parachanners

This Notal soil is mapped as a taxadjunct to the Notal series because it has a fine-loamy particle-size class. The Notal series averages more than 35 percent clay in the particle-size control section and has a fine particle-size class. In addition, the Notal soil in this map unit has electrical conductivities up to 30 mmhos/cm whereas the Notal series has electrical conductivities up to 16 mmhos/cm.

33—Kydestea-Vessilla-Rock outcrop complex, 15 to 60 percent slopes

Map Unit Setting

General setting: Flanks of Miners Mountain (fig. 139)
Major land resource area: 35—Colorado Plateau
Elevation: 5,760 to 7,980 feet (1,755 to 2,433 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 45 to 47 degrees F (7.2 to 8.3 degrees C)

Figure 139.—Landscape of map unit 33 (Kydestea-Vessilla-Rock outcrop complex, 15 to 60 percent slopes). This map unit is on scarp slopes on pediments on the flanks of Miners Mountain.

Mean annual soil temperature: 47 to 49 degrees F (8.3 to 9.4 degrees C)
Frost-free period: 125 to 145 days

Map Unit Composition

Kydestea and similar soils: 50 percent
Vessilla and similar soils: 30 percent
Rock outcrop, Moenkopi Formation sandstone: 15 percent
Minor components (5 percent) and their ecological sites:
Gladel soils on mountain slopes (shallow loamy soils); Upland Shallow Loam (Pinyon-Utah Juniper)

Description of the Kydestea Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents (fig. 140)
Landform: Scarp slopes on pediments
Geology: Moenkopi Formation sandstone (Triassic)
Parent material: Colluvium derived from calcareous sandstone over residuum weathered from calcareous sandstone
Slope: 15 to 60 percent, north to northwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 0.7 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None

Figure 140.—Profile of the Kydestea soil in map unit 33 (Kydestea-Vessilla-Rock outcrop complex, 15 to 60 percent slopes). Bedrock is at a depth of 20 centimeters. Scale is in centimeters.

Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY325UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, blue grama, and Indian ricegrass
Land capability classification (nonirrigated areas): 7e

Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	10-30
Rock fragments	25-65
Bare soil	5-15
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479173 meters E., 4231050 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); light yellowish brown (10YR 6/4) gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; 22 percent clay; weak medium subangular blocky structure; soft, very friable, moderately sticky and slightly plastic; few fine and few very fine roots throughout; many very fine irregular pores; 25 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C—4 to 8 inches (10 to 20 centimeters); very pale brown (10YR 7/4) extremely flaggy sandy loam, light yellowish brown (10YR 6/4) moist; 16 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and few very fine roots throughout; many very fine irregular pores; 70 percent flagstones; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

R—8 to 17.5 inches (20 to 45 centimeters); indurated, fractured sandstone; common fine and common medium roots at top of horizon.

Range in Characteristics

A horizon:

Hue—5YR, 7.5YR, or 10YR
Value—5 or 6 dry; 3 to 5 moist
Chroma—3 to 6, dry or moist
Texture—sandy clay loam, sandy loam, or loam
Clay content—15 to 25 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—25 to 50 percent gravel, cobbles, stones, channers, or flagstones

C horizon:

Hue—5YR, 7.5YR, or 10YR
Value—6 or 7 dry; 4 or 6 moist
Chroma—3 or 4, dry or moist
Texture—sandy clay loam, sandy loam, or loam
Clay content—15 to 25 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—35 to 70 percent gravel, cobbles, stones, channers, or flagstones

Description of the Vessilla Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents (fig. 141)

Landform: Scarp slopes on pediments

Figure 141.—Profile of the Vessilla soil in map unit 33 (Kydestea-Vessilla-Rock outcrop complex, 15 to 60 percent slopes). Bedrock is at a depth of 30 centimeters. Scale is in centimeters.

Geology: Moenkopi Formation sandstone (Triassic)
Parent material: Colluvium derived from calcareous sandstone over residuum weathered from calcareous sandstone
Slope: 15 to 60 percent, north to northwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 8 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 1.1 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High

Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY325UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, blue grama, and Indian ricegrass
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	25-30
Litter (<5 mm)	5-15
Rock fragments	55-65
Bare soil	2-10
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479154 meters E., 4230898 meters N., zone 12

A—0 to 5 inches (0 to 13 centimeters); yellowish brown (10YR 5/4) channery sandy loam, dark yellowish brown (10YR 4/4) moist; 14 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; many very fine and many fine irregular pores; 20 percent channers; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C—5 to 12 inches (13 to 30 centimeters); light yellowish brown (10YR 6/4) parachannery sandy loam, yellowish brown (10YR 5/4) moist; 12 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine and many fine irregular pores; 25 percent parachanners; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

R—12 to 21.5 inches (30 to 55 centimeters); strongly cemented, fractured sandstone; common fine and common medium roots in cracks.

Range in Characteristics

A horizon:
Hue—5YR, 7.5YR, or 10YR
Texture—sandy loam or loam
Clay content—10 to 25 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—10 to 30 percent gravel, cobbles, channers, or stones

C horizon:
Hue—5YR, 7.5YR, or 10YR
Texture—sandy loam or loam
Clay content—10 to 25 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—10 to 30 percent gravel, cobbles, channers, parachanners, or stones

Figure 142.—Landscape of map unit 34 (Kydestea-Vessilla-Rock outcrop complex, 2 to 15 percent slopes). This map unit is on ridges and footslopes on the flanks of Miners Mountain.

This Vessilla soil is mapped as a taxadjunct of the Vessilla series because it has a superactive clay activity class whereas the Vessilla series has an active clay activity class.

Description of the Rock Outcrop, Moenkopi Formation Sandstone

This component is characterized by gently sloping to steep rock outcrop. The lithology is sandstone. Typically, there are very few nearly vertical cliffs to impede vehicular travel. The vertical relief is commonly a few feet to several feet. Due to the steepness of slopes, the area can be negotiated by full-sized four-wheeled vehicles with care. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

34—Kydestea-Vessilla-Rock outcrop complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Flanks of Miners Mountain (fig. 142)
Major land resource area: 35—Colorado Plateau
Elevation: 6,450 to 7,900 feet (1,967 to 2,407 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 45 to 47 degrees F (7.2 to 8.3 degrees C)
Mean annual soil temperature: 47 to 49 degrees F (8.3 to 9.4 degrees C)
Frost-free period: 125 to 145 days

Map Unit Composition

Kydestea and similar soils: 40 percent
Vessilla and similar soils: 35 percent
Rock outcrop, Moenkopi Formation sandstone: 15 percent
Minor components (10 percent) and their ecological sites:
Coarse-loamy soils more than 20 inches deep to hard bedrock; Upland Stony Loam (Pinyon-Utah Juniper)

Description of the Kydestea Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents (fig. 143)
Landform: Ridgetops and footslopes of mountain slopes
Geology: Moenkopi Formation sandstone (Triassic)
Parent material: Slope alluvium derived from sandstone
Slope: 2 to 15 percent, northeast to west aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.4 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium

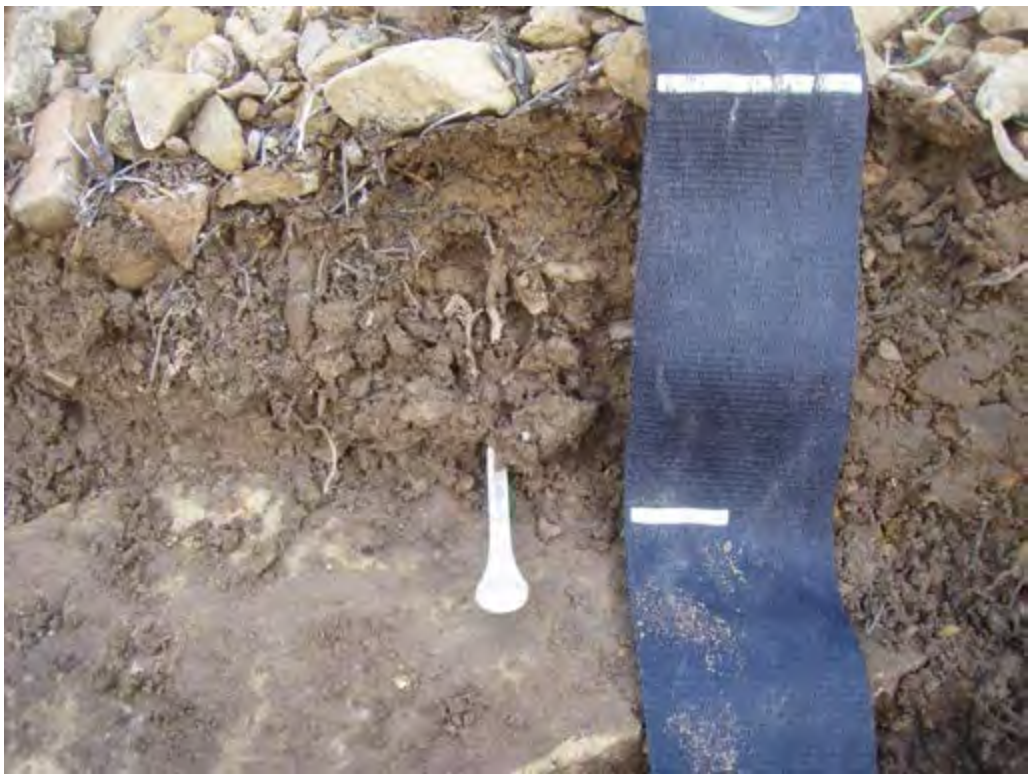

Figure 143.—Profile of the Kydestea soil in map unit 34 (Kydestea-Vessilla-Rock outcrop complex, 2 to 15 percent slopes). Bedrock is at a depth of 10 centimeters. Scale is in 10-centimeter increments.

Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Shallow Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY315UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, ponderosa pine, Geyer's sedge, and Indian ricegrass
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	25-35
Rock fragments	5-15
Bare soil	15-20
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 478693 meters E., 4229668 meters N., zone 12

C—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/3) very gravelly fine sandy loam, dark brown (7.5YR 3/3) moist; 20 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine and common fine irregular pores; 40 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; very abrupt smooth boundary.
R—4 to 14 inches (10 to 35 centimeters); indurated sandstone.

Range in Characteristics

Note: Some pedons may have an A horizon at the soil surface

C horizon:
Hue—7.5YR or 10YR
Value—3 to 5, dry or moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—15 to 25 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—35 to 50 percent gravel or cobbles

Description of the Vessilla Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents (fig. 144)
Landform: Ridgetops and footslopes of mountain slopes
Geology: Moenkopi Formation sandstone (Triassic)
Parent material: Residuum weathered from sandstone and/or slope alluvium derived from sandstone
Slope: 2 to 15 percent, north to west aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 3 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Figure 144.—Profile of the Vessilla soil in map unit 34 (Kydestea-Vessilla-Rock outcrop complex, 2 to 15 percent slopes). Bedrock is at a depth of 7 centimeters. Scale is in 10-centimeter increments.

Available water capacity (total inches): About 0.4 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Shallow Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY315UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, ponderosa pine, Geyer's sedge, and Indian ricegrass
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	25-35
Rock fragments	5-15
Bare soil	15-20
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 478993 meters E., 4229643 meters N., zone 12

C—0 to 3 inches (0 to 7 centimeters); brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 3/4) moist; 14 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 10 percent stones; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

R—3 to 12.5 inches (7 to 32 centimeters); indurated sandstone.

Range in Characteristics

Note: Some pedons may have an A horizon at the soil surface

C horizon:

Hue—7.5YR or 10YR
Value—5 or 6 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—14 to 20 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—10 to 30 percent gravel, cobbles, channers, or stones

This Vessilla soil is mapped as a taxadjunct of the Vessilla series because it has a superactive clay activity class whereas the Vessilla series has an active clay activity class.

Description of the Rock Outcrop, Moenkopi Formation Sandstone

This component is characterized by gently sloping to steep rock outcrop. The lithology is sandstone. Typically, there are very few nearly vertical cliffs to impede vehicular travel. The vertical relief commonly ranges from a few feet to several feet. Due to the steepness of slopes, the area can be negotiated by full-sized four-wheeled vehicles with care. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

35—Lavodnas-Retsabal complex, 15 to 60 percent slopes

Map Unit Setting

General setting: South Desert (fig. 145)
Major land resource area: 35—Colorado Plateau
Elevation: 5,560 to 6,690 feet (1,696 to 2,039 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Lavodnas and similar soils: 45 percent
Retsabal and similar soils: 40 percent
Minor components (15 percent) and their ecological sites:

Moderately deep, coarse-loamy soils with gypsic horizons on cuestas; Semidesert Shallow Gypsum (Mormontea)
Rock outcrop (Carmel Formation)

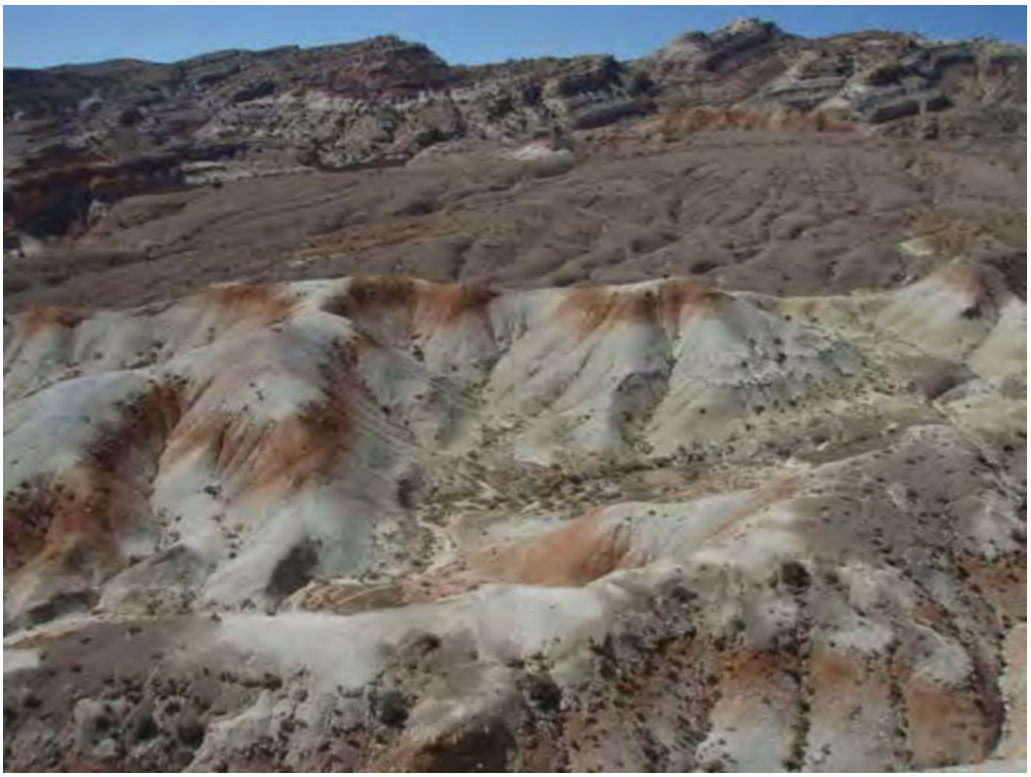

Figure 145.—Landscape of map unit 35 (Lavodnas-Retsabal complex, 15 to 60 percent slopes). This map unit is on hills in South Desert.

Description of the Lavodnas Soil

Taxonomic classification: Loamy, gypsic, mesic, shallow Leptic Haplogypsids (fig. 146)
Landform: Hills on cuestas, breaks, and structural benches
Geology: Carmel Formation (Jurassic)
Parent material: Slope alluvium derived from shale over residuum weathered from rock gypsum
Slope: 15 to 60 percent, south aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 12 inches; lithic bedrock at a depth of 8 to 16 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 1.3 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Gypsum (Mormontea)
Ecological site number: R035XY237UT
Present vegetation (in most areas): Needle and thread, Torrey's jointfir, galleta, shadscale, and crispleaf buckwheat

Figure 146.—Profile of the Lavodnas soil in map unit 35 (Lavodnas-Retsabal complex, 15 to 60 percent slopes). Soft bedrock is at a depth of 17 centimeters; hard bedrock is at a depth of 26 centimeters. Scale is in centimeters.

Land capability classification (nonirrigated areas): 7e

Ground cover (percent):

Plant canopy	15-25
Litter (<5 mm)	0-5
Rock fragments	0-40
Bare soil	20-30
Cyanobacteria crust	0-5
Lichen crust	0-15
Moss crust	0
Salt crust	0
Gypsum crust	5-15

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479602 meters E., 4249489 meters N., zone 12

Cy1—0 to 1 inch (0 to 3 centimeters); light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; 18 percent clay; moderate medium subangular blocky structure; nonsticky and moderately plastic; common very fine roots throughout; common fine vesicular pores; carbonate that is finely disseminated and common fine irregular gypsum crystals in matrix; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear smooth boundary.

Cy2—1 to 6.5 inches (3 to 17 centimeters); pale olive (5Y 6/3) silt loam, olive (5Y 5/3) moist; 22 percent clay; moderate fine subangular blocky structure; slightly sticky and moderately plastic; common very fine roots throughout; common fine

irregular pores; carbonate that is finely disseminated and many fine irregular gypsum crystals in matrix; 10 percent parachanners; slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; abrupt smooth boundary.

Cr—6.5 to 10 inches (17 to 26 centimeters); weakly cemented gypsum.

R—10 to 20 inches (26 to 51 centimeters); strongly cemented gypsum.

Range in Characteristics

AC or Cy1 horizon:

Hue—2.5Y or 5YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—2 to 4 dry; 2 to 6 moist
Texture—fine sandy loam, loam, or silt loam
Clay content—15 to 20 percent
Calcium carbonate equivalent—1 to 4 percent
Gypsum content—2 to 25 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel and cobbles

Cy2 horizon:

Hue—5Y, 7.5YR, or 10YR
Chroma—1 to 3 dry; 3 or 4 moist
Texture—loam or silt loam
Clay content—20 to 25 percent
Calcium carbonate equivalent—0 to 15 percent
Gypsum content—15 to 40 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 20 percent parachanners
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Lavodnas soil is mapped as a taxadjunct of the Lavodnas series because it has gypsic mineralogy (contains more than 15 percent gypsum) whereas the Lavodnas series has mixed mineralogy.

Description of the Retsabal Soil

Taxonomic classification: Fine-gypseous, hypergypsic, mesic, shallow Leptic Haplogypsids
Landform: Homoclinal ridges
Geology: Carmel Formation (Jurassic)
Parent material: Eolian deposits derived from sandstone and shale over residuum weathered from rock gypsum
Slope: 15 to 60 percent, south aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 10 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Gypsum (Mormontea)

Ecological site number: R035XY237UT
Present vegetation (in most areas): Torrey's jointfir, crispleaf buckwheat, galleta, shadscale, and Indian ricegrass
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	5-15
Litter (<5 mm)	0-5
Rock fragments	0-40
Bare soil	35-45
Cyanobacteria crust	10-20
Lichen crust	0-15
Moss crust	0
Salt crust	0
Gypsum crust	5-15

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 470512 meters E., 4255386 meters N., zone 12

AC—0 to 1 inch (0 to 2 centimeters); very pale brown (10YR 7/3) silt loam, light brownish gray (10YR 6/2) moist; 15 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots throughout; many very fine vesicular pores; carbonate, finely disseminated throughout; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.4; abrupt wavy boundary.

Byy—1 to 4.5 inches (2 to 12 centimeters); white (10YR 8/1) fine gypsum material, white (10YR 8/1) moist; 18 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots throughout; many very fine irregular pores; many medium irregular gypsum crystals in matrix; noneffervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; abrupt wavy boundary.

Cr—4.5 to 14.5 inches (12 to 37 centimeters); weakly cemented gypsum.

Range in Characteristics

AC horizon:
Chroma—2 or 3 dry
Clay content—15 to 20 percent
Calcium carbonate equivalent—2 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

Byy horizon:
Clay content—12 to 18 percent
Calcium carbonate equivalent—0 to 1 percent
Gypsum content—50 to 85 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 30 percent paragravel

36—Mathis-Rock outcrop complex, 15 to 90 percent slopes

Map Unit Setting

General setting: Top of Circle Cliffs, areas south of Burr Trail, canyons west of the Waterpocket Fold, and areas between Pleasant Creek and Burr Trail (fig. 147)
Major land resource area: 35—Colorado Plateau

Figure 147.—Landscape of map unit 36 (Mathis-Rock outcrop complex, 15 to 90 percent slopes).

Elevation: 5,350 to 6,320 feet (1,632 to 1,925 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Mathis, cool and similar soils: 70 percent
Rock outcrop, Wingate Sandstone: 30 percent

Description of the Mathis, Cool Soil

Note: A cool phase and upland ecological site are assigned to this ustic aridic soil because its aspect and landscape position provide additional moisture for growth of vegetation.

Taxonomic classification: Sandy-skeletal, mixed, mesic Ustic Torriorthents (fig. 148)
Landform: Escarpments and talus slopes
Geology: Wingate Sandstone (Triassic)
Parent material: Colluvium derived from sandstone over residuum weathered from sandstone
Slope: 15 to 90 percent, northeast to southeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 40 to 80 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 3.4 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None

Figure 148.—Profile of the Mathis soil in map unit 36 (Mathis-Rock outcrop complex, 15 to 90 percent slopes). Scale is in centimeters.

Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Stony Sand (Utah Juniper-Pinyon)
Ecological site number: R035XY323UT
Present vegetation (in most areas): Salina wildrye, twoneedle pinyon, Indian ricegrass, Utah juniper, and galleta
Land capability classification (nonirrigated areas): 7s

Ground cover (percent): (fig. 149)

Plant canopy	20-30
Litter (<5 mm)	0-10
Rock fragments	50-60
Bare soil	10-20
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 497467 meters E., 4188189 meters N., zone 12

A—0 to 6 inches (0 to 15 centimeters); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; 7 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; many very fine and many fine irregular pores; 5 percent gravel, 3 percent cobbles, and 3 percent stones; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C1—6 to 14 inches (15 to 36 centimeters); reddish yellow (5YR 6/6) very stony loamy fine sand, yellowish red (5YR 4/6) moist; 6 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; many very fine and many fine irregular pores; 15 percent gravel, 20 percent cobbles, and 15 percent stones; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Figure 149.—Typical surface of the Mathis soil in map unit 36 (Mathis-Rock outcrop complex, 15 to 90 percent slopes).

C2—14 to 71 inches (36 to 180 centimeters); reddish yellow (5YR 6/6) extremely cobbly loamy fine sand, yellowish red (5YR 4/6) moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; common fine, common medium, and common coarse roots throughout; many very fine and many fine irregular pores; 30 percent gravel, 20 percent cobbles, and 10 percent stones; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:
Texture—loamy fine sand or fine sandy loam
Clay content—3 to 10 percent
Calcium carbonate equivalent—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 40 percent gravel, cobbles, stones, and boulders

C horizons:
Value—5 or 6 dry; 4 or 5 moist
Texture—loamy fine sand or fine sand
Clay content—3 to 10 percent
Calcium carbonate equivalent—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, stones, and boulders

This Mathis soil differs from the Mathis series in that it is deep or very deep to bedrock whereas the Mathis series is moderately deep to bedrock.

Description of the Rock Outcrop, Wingate Sandstone

This component is characterized by many cliffs and escarpments with very steep colluvial and talus slopes. The lithology is Wingate Sandstone. The vertical relief of the cliffs ranges from a few feet to several tens of feet, and the continuity of the cliffs is broken. Rockfall, boulders, and stones dominate the surface. Typically, the steepness, vertical relief, and continuity of cliffs make vehicular travel virtually impossible. Travel by foot is difficult and strenuous. This component is usually a natural barrier to livestock and many other terrestrial animals. The area is typically barren but may have vegetation growing in cracks and crevices or in the colluvial and talus sediment covering the surface.

37—Metuck-Rock outcrop-Vessilla complex, 15 to 60 percent slopes

Map Unit Setting

General setting: Flanks of Miners Mountain (fig. 150)
Major land resource area: 35—Colorado Plateau
Elevation: 5,500 to 7,720 feet (1,675 to 2,354 meters)
Mean annual precipitation: 9 to 16 inches (229 to 406 millimeters)
Mean annual air temperature: 45 to 47 degrees F (7.2 to 8.3 degrees C)
Mean annual soil temperature: 47 to 49 degrees F (8.3 to 9.4 degrees C)
Frost-free period: 125 to 145 days

Map Unit Composition

Metuck and similar soils: 30 percent
Rock outcrop, Kaibab Formation limey sandstone: 25 percent

Figure 150.—Landscape of map unit 37 (Metuck-Rock outcrop-Vessilla complex, 15 to 60 percent slopes). This map unit is on mountain slopes and sides of canyons.

Vessilla and similar soils: 25 percent
Minor components (20 percent) and their ecological sites:
Gladel soils on mountain slopes (shallow loamy soils); Upland Shallow Loam (Pinyon-Utah Juniper)
Deep, loamy-skeletal soils with calcic horizons on mountain slopes; Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)

Description of the Metuck Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents (fig. 151)
Landform: Canyons and mountain slopes
Geology: Kaibab Limestone (Permian)
Parent material: Colluvium derived from arenaceous limestone over residuum weathered from arenaceous limestone
Slope: 35 to 60 percent, east to northwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 10 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.2 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high

Figure 151.—Profile of the Metuck soil in map unit 37 (Metuck-Rock outcrop-Vessilla complex, 15 to 60 percent slopes). Bedrock is at a depth of 37 inches. Scale is in centimeters.

Hydrologic group: D
Calcium carbonate content (maximum): About 20 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY325UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, littleleaf mountain mahogany, roundleaf buffaloberry, and Salina wildrye
Land capability classification (nonirrigated areas): 7s

Typical Profile

Note: This modal pedon is located just outside the park boundary and is shared with the survey of the Loa-Marysvale area, Utah.

Geographic Coordinate System (Universal Transverse Mercator): 477929 meters E., 4231019 meters N., zone 12

A—0 to 10 inches (0 to 25 centimeters); brown (7.5YR 5/3) very gravelly fine sandy loam, dark brown (7.5YR 3/4) moist; 15 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine irregular pores; 30 percent gravel and 10 percent cobbles; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bw—10 to 14.5 inches (25 to 37 centimeters); reddish brown (5YR 5/3) very cobbly fine sandy loam, reddish brown (5YR 4/4) moist; 17 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout and common medium roots at top of horizon; many very fine irregular pores; 10 percent gravel and 25 percent cobbles; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

R—14.5 to 24.5 inches (37 to 62 centimeters); indurated arenaceous limestone.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

A horizon:

Value—5 or 6 dry; 3 to 5 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 60 percent gravel or cobbles

Bw horizon:

Value—4 to 6 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—10 to 20 percent
Calcium carbonate equivalent—5 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 60 percent gravel or cobbles

Description of the Rock Outcrop, Kaibab Formation Limey Sandstone

This component is characterized by strongly sloping to steep rock outcrop. The lithology is arenaceous limestone. The vertical relief ranges from a few feet to several feet, and the continuity of cliffs is broken. Typically, the area is steep enough and there are enough cliffs to make travel by full-sized four-wheeled vehicles very difficult. Travel by a small ATV or motorcycle is usually possible though difficult. There are usually no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

Description of the Vessilla Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents (fig. 152)

Figure 152.—Profile of the Vessilla soil in map unit 37 (Metuck-Rock outcrop-Vessilla complex, 15 to 60 percent slopes). Bedrock is at a depth of 20 centimeters. Scale is in centimeters.

Landform: Canyons and mountain slopes
Geology: Kaibab Limestone (Permian)
Parent material: Colluvium derived from arenaceous limestone and/or slope alluvium derived from arenaceous limestone over residuum weathered from arenaceous limestone
Slope: 15 to 35 percent, north to southeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.8 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 20 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Shallow Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY315UT

Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, littleleaf mountain mahogany, Indian ricegrass, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	10-20
Rock fragments	40-50
Bare soil	5-10
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Note: This modal pedon is located just outside the park boundary and is shared with the survey of the Loa-Marysvale area, Utah.

Geographic Coordinate System (Universal Transverse Mercator): 478451 meters E., 4229232 meters N., zone 12

A—0 to 4.5 inches (0 to 12 centimeters); light brown (7.5YR 6/4) gravelly sandy loam, brown (7.5YR 4/4) moist; 18 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and few very fine roots throughout; common medium irregular, common medium interstitial, common very fine irregular, common very fine interstitial, common fine irregular, and common fine interstitial pores; 20 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bw—4.5 to 8 inches (12 to 20 centimeters); brown (7.5YR 4/2) sandy loam, dark brown (7.5YR 3/2) moist; 10 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common medium roots throughout; many very fine and many fine irregular pores; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

R—8 to 17.5 inches (20 to 45 centimeters); indurated, fractured, arenaceous limestone; many fine, many medium, and many coarse roots at top of horizon.

Range in Characteristics

A horizon:
Value—5 or 6 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—8 to 20 percent
Calcium carbonate equivalent—5 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel

Bw horizon:
Value—4 or 5 dry; 3 or 4 moist
Chroma—2 or 3, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—8 to 20 percent
Calcium carbonate equivalent—5 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel

This Vessilla soil is mapped as a taxadjunct to the Vessilla series because it has a superactive clay activity class whereas the Vessilla series has an active clay activity class.

38—Mezzo family loamy fine sand, 2 to 20 percent slopes

Map Unit Setting

General setting: Paradise Flats and Little Sand Flat
Major land resource area: 35—Colorado Plateau
Elevation: 6,440 to 7,650 feet (1,962 to 2,332 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 44 to 46 degrees F (6.7 to 7.8 degrees C)
Mean annual soil temperature: 46 to 48 degrees F (7.8 to 8.9 degrees C)
Frost-free period: 120 to 140 days

Map Unit Composition

Mezzo family and similar soils: 80 percent
Minor components (20 percent) and their ecological sites:
Parkwash soils on coppice mounds and sand sheets on structural benches (shallow, sandy soils); Upland Shallow Sand (Pinyon-Utah Juniper)
Rock outcrop (Navajo Sandstone)

Description of the Mezzo Family Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau whereas the Mezzo series occurs in MLRA 47—Wasatch and Uintah Mountains.

Taxonomic classification: Frigid, coated Ustic Quartzipsamments (fig. 153)
Landform: Sand sheets and dunes (fig. 154)
Geology: Eolian deposits (Quaternary)
Parent material: Eolian deposits derived from sandstone
Slope: 2 to 20 percent, north to west aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 40 to 100 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 5.3 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Sand (Mountain Big Sagebrush)
Ecological site number: R035XY307UT
Present vegetation (in most areas): Blue grama, needle and thread, Indian ricegrass, sandhill muhly, brittle pricklypear, fourwing saltbush, and winterfat
Land capability classification (nonirrigated areas): 6s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	5-20
Rock fragments	0-5

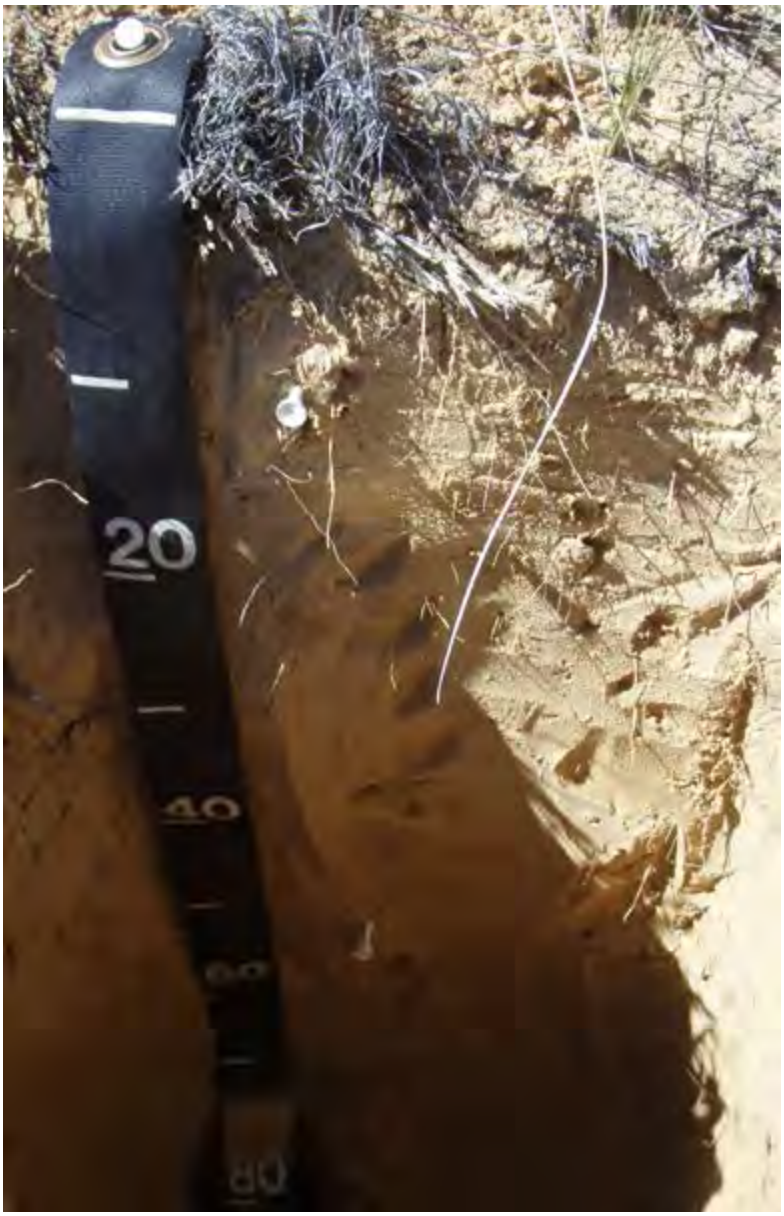

Figure 153.—Profile of the Mezzo family soil in map unit 38 (Mezzo family loamy fine sand, 2 to 20 percent slopes). Scale is in centimeters.

Bare soil	25-35
Cyanobacteria crust	2-25
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 467815 meters E., 4250915 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); pink (7.5YR 7/4) loamy fine sand, brown (7.5YR 5/4) moist; 4 percent clay; weak very fine subangular blocky structure;

Figure 154.—The Mezzo family soil in map unit 38 (Mezzo family loamy fine sand, 2 to 20 percent slopes) on sand sheets and dunes.

soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine and many fine interstitial pores; noneffervescent; neutral, pH 7.2; clear smooth boundary.

C1—4 to 20 inches (10 to 51 centimeters); pink (7.5YR 7/4) loamy fine sand, brown (7.5YR 5/4) moist; 4 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; noneffervescent; slightly alkaline, pH 7.4; gradual smooth boundary.

C2—20 to 78.5 inches (51 to 200 centimeters); reddish yellow (7.5YR 7/6) fine sand, reddish yellow (7.5YR 6/6) moist; 3 percent clay; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine irregular pores; noneffervescent; slightly alkaline, pH 7.4.

Range in Characteristics

A horizon:

Value—6 or 7 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—loamy fine sand or fine sand
Clay content—2 to 7 percent
Calcium carbonate equivalent—0 to 1 percent
Electrical conductivity—0 to 2 mmhos/cm
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

C horizons:

Hue—7.5YR or 5YR
Value—6 or 7 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—loamy fine sand or fine sand

Clay content—2 to 9 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

39—Mido-Rock outcrop complex, 10 to 35 percent slopes

Map Unit Setting

General setting: Strike Valley (fig. 155)
Major land resource area: 35—Colorado Plateau
Elevation: 5,000 to 5,770 feet (1,524 to 1,758 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Mido and similar soils: 65 percent
Rock outcrop, Entrada Sandstone: 25 percent
Minor components (10 percent) and their ecological sites:
Arches and similar soils on structural benches (shallow, sandy soils); Semidesert Shallow Sand (Utah Juniper-Pinyon)

Description of the Mido Soil

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 156)

Figure 155.—Landscape of map unit 39 (Mido-Rock outcrop complex, 10 to 35 percent slopes). This map unit is on structural benches in Strike Valley.

Figure 156.—Profile of the Mido soil in map unit 39 (Mido-Rock outcrop complex, 10 to 35 percent slopes). Scale is in centimeters.

Landform: Dunes (fig. 157)
Geology: Quaternary eolian deposits
Parent material: Eolian sands derived from sandstone
Slope: 10 to 35 percent, northeast to south aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 5.5 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches

Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sand (Fourwing Saltbush)
Ecological site number: R035XY212UT
Present vegetation (in most areas): Fourwing saltbush, galleta, blue grama, Indian ricegrass, and plains pricklypear
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	15-30
Rock fragments	0-5
Bare soil	10-20
Cyanobacteria crust	15-35
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 496904 meters E., 4192897 meters N., zone 12

Figure 157.—The Mido soil in map unit 39 (Mido-Rock outcrop complex, 10 to 35 percent slopes) on sand sheets and dunes.

A—0 to 4.5 inches (0 to 11 centimeters); brown (7.5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; 7 percent clay; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bw—4.5 to 15 inches (11 to 38 centimeters); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; 6 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine, common fine, and few medium roots throughout; many fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

C1—15 to 45.5 inches (38 to 115 centimeters); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; 6 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

C2—45.5 to 61 inches (115 to 155 centimeters); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6) moist; 6 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; many fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Cr—61 to 64 inches (155 to 163 centimeters); weakly cemented sandstone; abrupt smooth boundary.

R—64 to 74 inches (163 to 188 centimeters); indurated sandstone.

Range in Characteristics

A horizon:

Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—3 to 8 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm

Bw and C horizons:

Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—3 to 8 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm

Description of the Rock Outcrop, Entrada Sandstone

This component is characterized by gently sloping to steep rock outcrop. The lithology is Entrada Sandstone. The vertical relief ranges from a few feet to several feet, and the continuity of cliffs is broken. Typically, the area is steep enough and there are enough cliffs and escarpments to make travel by full-sized four-wheeled vehicles very difficult. Travel by a small ATV or motorcycle is usually possible though difficult. There are usually no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

40—Mido-Strych-Reef complex, 2 to 50 percent slopes

Map Unit Setting

General setting: Areas along the Fremont River Gorge
Major land resource area: 35—Colorado Plateau
Elevation: 4,990 to 5,820 feet (1,522 to 1,773 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Mido and similar soils: 40 percent
Strych and similar soils: 30 percent
Reef and similar soils: 15 percent
Minor components (15 percent) and their ecological sites:
- Rock outcrop (Navajo Sandstone)
- Moderately deep or deep, sandy-skeletal soils on flood-plain steps of washes; Semidesert Stony Loam (Utah Juniper-Pinyon)
- Moderately deep, coarse-loamy soils with calcic horizons on strath terraces; Semidesert Stony Loam (Utah Juniper-Pinyon)
- Very deep, coarse-loamy soils with gypsic horizons on pediments; Semidesert Sandy Loam (Fourwing Saltbush)

Description of the Mido Soil

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 158)
Landform: Sand sheets on strath terraces (fig. 159)
Geology: Eolian deposits (Quaternary)
Parent material: Eolian sands derived from sandstone
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: More than 20 in/hr (very rapid)
Available water capacity (total inches): About 4.3 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 2 SAR (slightly sodic)
Ecological site name: Semidesert Sand (Fourwing Saltbush)
Ecological site number: R035XY212UT
Present vegetation (in most areas): Indian ricegrass, mesa dropseed, needle and thread, Torrey's jointfir, and fourwing saltbush
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	35-45
Litter (<5 mm)	5-10
Rock fragments	0-5
Bare soil	25-40

Figure 158.—Profile of the Mido soil in map unit 40 (Mido-Strych-Reef complex, 2 to 50 percent slopes). Scale is in centimeters.

Cyanobacteria crust	15-25
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 482886 meters E., 4237332 meters N., zone 12

AC—0 to 1.5 inches (0 to 4 centimeters); reddish yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/6) moist; 2 percent clay; weak very thin platy structure parting to weak fine subangular blocky; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; noneffervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C1—1.5 to 9.5 inches (4 to 24 centimeters); reddish yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/8) moist; 1 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; very slightly effervescent; slightly alkaline, pH 7.8; gradual wavy boundary.

Ck1—9.5 to 41.5 inches (24 to 105 centimeters); reddish yellow (7.5YR 6/6) very fine sand, strong brown (7.5YR 5/8) moist; 1 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; carbonate, finely disseminated throughout; strongly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

Ck2—41.5 to 47 inches (105 to 120 centimeters); reddish yellow (7.5YR 6/6) fine sand, strong brown (7.5YR 5/8) moist; 2 percent clay; massive; soft, very friable, nonsticky and nonplastic; many very fine interstitial pores; carbonate, finely disseminated throughout; 3 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; gradual wavy boundary.

C2—47 to 71 inches (120 to 180 centimeters); reddish yellow (7.5YR 6/8) fine sand, strong brown (7.5YR 5/8) moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; many very fine interstitial pores; slightly effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

AC horizon:

Clay content—1 to 5 percent
Calcium carbonate equivalent—0 to 3 percent
Rock fragments—0 to 10 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 or 8.4)

Figure 159.—Landscape of the Mido soil in map unit 40 (Mido-Strych-Reef complex, 2 to 50 percent slopes). This soil occurs on sand sheets on strath terraces along the Fremont River Gorge.

Figure 160.—Profile of the Strych soil in map unit 40 (Mido-Strych-Reef complex, 2 to 50 percent slopes). Scale is in centimeters.

C horizons:

Chroma—6 or 8, dry or moist
Texture—fine sand or very fine sand
Clay content—1 to 5 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—0 to 10 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Strych Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids (fig. 160)

Landform: Strath terraces (fig. 161)
Geology: Terrace deposits (Quaternary)
Parent material: Alluvium derived from basalt
Slope: 6 to 35 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 4.1 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: A
Calcium carbonate content (maximum): About 40 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Stony Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY246UT
Present vegetation (in most areas): Utah juniper, black grama, twoneedle pinyon, blue grama, galleta, roundleaf buffaloberry, and Torrey's jointfir
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 162)

Plant canopy	30-40
Litter (<5 mm)	5-15

Figure 161.—The Strych soil in map unit 40 (Mido-Strych-Reef complex, 2 to 50 percent slopes) on strath terraces in the Fremont River Gorge.

Figure 162.—Typical surface of the Strych soil in map unit 40 (Mido-Strych-Reef complex, 2 to 50 percent slopes).

Rock fragments	40-55
Bare soil	5-10
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479586 meters E., 4237521 meters N., zone 12

Ak—0 to 3.5 inches (0 to 9 centimeters); reddish brown (5YR 5/4) cobbly fine sandy loam, yellowish red (5YR 4/6) moist; 12 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and common fine roots throughout and common coarse roots at top of horizon; many very fine irregular pores; common fine irregular carbonate masses on bottom of rock fragments; 10 percent gravel and 6 percent cobbles; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk—3.5 to 17.5 inches (9 to 45 centimeters); light reddish brown (5YR 6/3) very gravelly sandy loam, reddish brown (5YR 5/4) moist; 10 percent clay; moderate medium prismatic structure; moderately hard, firm, slightly sticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; common medium irregular carbonate masses on bottom of rock fragments and

many coarse irregular carbonate masses in matrix; 30 percent gravel and 5 percent cobbles; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Ck—17.5 to 71 inches (45 to 180 centimeters); reddish brown (5YR 5/3) extremely gravelly coarse sandy loam, dark reddish brown (5YR 3/3) moist; 10 percent clay; massive; loose, slightly sticky and nonplastic; few very fine, few fine, and few medium roots throughout; many very fine interstitial pores; common medium irregular carbonate masses on bottom of rock fragments; 50 percent gravel, 10 percent cobbles, and 5 percent stones; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Ak horizon:

Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 15 percent
Calcium carbonate equivalent—10 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 80 percent gravel, cobbles, and stones

Bk horizon:

Hue—7.5YR or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 to 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—20 to 40 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 50 percent gravel, cobbles, and stones

Ck horizon:

Clay content—10 to 15 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 65 percent gravel, cobbles, and stones

Description of the Reef Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 163)
Landform: Strath terraces (fig. 164)
Geology: Terrace deposits (Quaternary)
Parent material: Alluvium derived from basalt
Slope: 35 to 50 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.3 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 20 percent

Figure 163.—Profile of the Reef soil in map unit 40 (Mido-Strych-Reef complex, 2 to 50 percent slopes). Hard sandstone bedrock is at a depth of 10 centimeters. Scale is in centimeters.

Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Ecological site number: R035XY240UT
Present vegetation (in most areas): Utah juniper, black grama, galleta, twoneedle pinyon, Torrey's jointfir, blue grama, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	5-15
Rock fragments	45-60
Bare soil	5-15
Cyanobacteria crust	0-10
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479750 meters E., 4237603 meters N., zone 12

Ck—0 to 4 inches (0 to 10 centimeters); reddish brown (5YR 5/4) very stony fine sandy loam, yellowish red (5YR 4/6) moist; 12 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine, few fine, and few medium roots throughout; many very fine irregular pores; common fine irregular carbonate masses on bottom of rock fragments; 20 percent gravel, 10 percent cobbles, and 10 percent stones; violently effervescent; moderately alkaline, pH 8.4; very abrupt wavy boundary.

R—4 to 14 inches (10 to 35 centimeters); indurated sandstone; common coarse roots at top of horizon.

Range in Characteristics

Note: Some pedons have an A horizon at the surface that has colors and textures similar to those of the C horizon but has slightly more organic matter

C horizon:

Hue—5YR or 2.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or very fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—10 to 20 percent

Figure 164.—The Reef soil in map unit 40 (Mido-Strych-Reef complex, 2 to 50 percent slopes) on strath terraces in the Fremont River Gorge.

Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 85 percent gravel, cobbles, and stones

41—Mikim-Mivida, moist, complex, 3 to 15 percent slopes

Map Unit Setting

General setting: Strike Valley and areas near Cedar Mesa Campground
Major land resource area: 35—Colorado Plateau
Elevation: 5,510 to 5,760 feet (1,679 to 1,756 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Mikim and similar soils: 50 percent
Mivida, moist and similar soils: 40 percent
Minor components (10 percent) and their ecological sites:
Abra, moist soils on mesas (very deep, fine-loamy soils with calcic horizons); Semidesert Loam (Wyoming Big Sagebrush)

Description of the Mikim Soil

Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Ustic Torriorthents
Landform: Mesas (fig. 165)
Geology: Quaternary eolian deposits
Parent material: Eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 3 to 15 percent, west to southwest aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 36 to 52 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 7.1 (high)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: B
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY209UT
Present vegetation (in most areas): Wyoming big sagebrush, Utah juniper, twoneedle pinyon, plains pricklypear, and blue grama
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	20-30
Rock fragments	0-10
Bare soil	10-20
Cyanobacteria crust	20-35

Figure 165.—The Mikim soil in map unit 41 (Mikim-Mivida, moist, complex, 3 to 15 percent slopes) on mesas in Strike Valley.

Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 492437 meters E., 4206456 meters N., zone 12

A—0 to 1 inch (0 to 3 centimeters); strong brown (7.5YR 5/6) very fine sandy loam, strong brown (7.5YR 4/6) moist; 11 percent clay; moderate thin platy structure; soft, very friable, nonsticky and slightly plastic; common fine and common very fine roots throughout; common very fine irregular pores; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; clear smooth boundary.

BC—1 to 7.5 inches (3 to 19 centimeters); brown (7.5YR 5/4) very fine sandy loam, strong brown (7.5YR 4/6) moist; 13 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and slightly plastic; common very fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; clear wavy boundary.

2C—7.5 to 42 inches (19 to 107 centimeters); pale yellow (2.5Y 7/4) loam, light yellowish brown (2.5Y 6/4) moist; 20 percent clay; massive; slightly hard, friable, slightly sticky and moderately plastic; common very fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout; 5 percent channers; strongly effervescent, by HCl, 1 normal; strongly alkaline, pH 8.8; gradual smooth boundary.

2Cr—42 to 52 inches (107 to 132 centimeters); weakly cemented shale.

Range in Characteristics

A horizon:
Clay content—8 to 15 percent
Calcium carbonate equivalent—1 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

BC horizon:
Clay content—10 to 15 percent
Calcium carbonate equivalent—2 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

2C horizon:
Clay content—18 to 25 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—0 to 5
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent parachanners

This Mikim soil differs from the Mikim series in that it has very fine sandy loam surface layers and is deep to a paralithic contact whereas the Mikim series has loam or clay loam surface layers and is very deep.

Description of the Mivida, Moist Soil

Note: A moist phase is assigned to this soil to account for the sagebrush ecological site.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids
Landform: Mesas (fig. 166)
Geology: Quaternary eolian deposits
Parent material: Eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 3 to 15 percent, east aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 11.3 (very high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Loam (Wyoming Big Sagebrush)
Ecological site number: R035XY209UT
Present vegetation (in most areas): Wyoming big sagebrush, Utah juniper, twoneedle pinyon, plains pricklypear, and blue grama
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	20-30

Figure 166.—The Mivida, moist soil in map unit 41 (Mikim-Mivida, moist, complex, 3 to 15 percent slopes) on mesas in Strike Valley.

Rock fragments	0-10
Bare soil	10-20
Cyanobacteria crust	20-35
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 491927 meters E., 4206425 meters N., zone 12

A—0 to 2.5 inches (0 to 6 centimeters); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; 15 percent clay; moderate thin platy structure; soft, very friable, nonsticky and slightly plastic; common very fine roots throughout; common fine irregular pores; carbonate, finely disseminated throughout; strongly effervescent, by HCl, 1 normal; neutral, pH 7.2; clear smooth boundary.

Bw—2.5 to 35 inches (6 to 89 centimeters); light reddish brown (5YR 6/4) very fine sandy loam, yellowish red (5YR 4/6) moist; 18 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common fine irregular pores; carbonate, finely disseminated throughout; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; gradual smooth boundary.

Bk—35 to 71 inches (89 to 180 centimeters); light reddish brown (5YR 6/3) very fine sandy loam, yellowish red (5YR 4/6) moist; 19 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common fine irregular pores; few distinct carbonate coats on rock fragments and common medium threadlike carbonate

masses in matrix; 5 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon:
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—very fine sandy loam, fine sandy loam, or loamy fine sand
Clay content—8 to 15 percent
Calcium carbonate equivalent—0 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel

Bw horizon:
Value—4 to 6, dry or moist
Clay content—10 to 18 percent
Calcium carbonate equivalent—0 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Bk horizon:
Value—4 or 5 moist
Chroma—3 or 4 dry; 4 or 6 moist
Texture—sandy clay loam, very fine sandy loam, or fine sandy loam
Clay content—9 to 25 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel

42—Milok-Clapper complex, 2 to 20 percent slopes

Map Unit Setting

General setting: Upper Cathedral Valley
Major land resource area: 35—Colorado Plateau
Elevation: 6,500 to 6,770 feet (1,981 to 2,062 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Milok, cool and similar soils: 50 percent
Clapper and similar soils: 40 percent
Minor components (10 percent) and their ecological sites:
Moderately deep, coarse-loamy soils with calcic horizons on structural benches; Semidesert Sandy Loam (Fourwing Saltbush)

Description of the Milok, Cool Soil

Note: A cool phase is assigned to this soil to account for the fourwing saltbush ecological site.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids (fig. 167)
Landform: Pediments and plateaus (fig. 168)

Figure 167.—Profile of the Milok soil in map unit 42 (Milok-Clapper complex, 2 to 20 percent slopes). The calcic horizon begins at a depth of about 37 centimeters. Scale is in centimeters.

Geology: Eolian deposits (Holocene and Upper Pleistocene) and pediment deposits (Pleistocene and Upper Pliocene)
Parent material: Eolian deposits derived from sandstone over alluvium derived from basalt
Slope: 2 to 20 percent, northwest to northeast aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 9.1 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches

Figure 168.—The Milok soil in map unit 42 (Milok-Clapper complex, 2 to 20 percent slopes) on pediments in upper Cathedral Valley.

Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 45 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): Blue grama, galleta, fourwing saltbush, Indian ricegrass, mesa dropseed, nodding buckwheat, and winterfat
Land capability classification (nonirrigated areas): 6s
Ground cover (percent):

Plant canopy	30-45
Litter (<5 mm)	15-20
Rock fragments	0-25
Bare soil	25-40
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 46,629 meters E., 4261841 meters N., zone 12

A—0 to 7 inches (0 to 18 centimeters); brown (7.5YR 5/3) sandy loam, dark brown (7.5YR 3/3) moist; 10 percent clay; weak very thick platy structure; very friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; many very fine and many fine irregular pores; 2 percent gravel; slightly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

Bw—7 to 14.5 inches (18 to 37 centimeters); light brown (7.5YR 6/3) cobbly sandy loam, brown (7.5YR 4/4) moist; 17 percent clay; weak medium subangular blocky structure; friable, moderately sticky and moderately plastic; common fine and common very fine roots throughout; many very fine and many fine irregular pores; 10 percent gravel and 20 percent cobbles; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk1—14.5 to 22.5 inches (37 to 57 centimeters); pinkish white (7.5YR 8/2) sandy loam, light brown (7.5YR 6/4) moist; 15 percent clay; weak fine subangular blocky structure; friable, moderately sticky and slightly plastic; few very fine roots throughout; many very fine and many fine irregular pores; common medium irregular carbonate masses on bottom of rock fragments and many medium irregular carbonate masses in matrix; 3 percent gravel and 10 percent cobbles; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—22.5 to 78.5 inches (57 to 200 centimeters); white (7.5YR 8.5/1) sandy loam, pinkish white (7.5YR 8/2) moist; 19 percent clay; weak fine subangular blocky structure; very firm, moderately sticky and moderately plastic; many very fine and many fine irregular pores; many medium irregular carbonate masses in matrix; 2 percent gravel; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Hue—7.5YR or 10YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or very fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel and cobbles

Bw horizon:

Value—5 or 6 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 25 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel and cobbles

Bk1 horizon:

Value—6 to 8 dry; 5 to 7 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—15 to 45 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel and cobbles

Bk2 horizon:

Value—6 to 8.5 dry; 6 to 8 moist
Chroma—1 to 4 dry; 2 to 4 moist

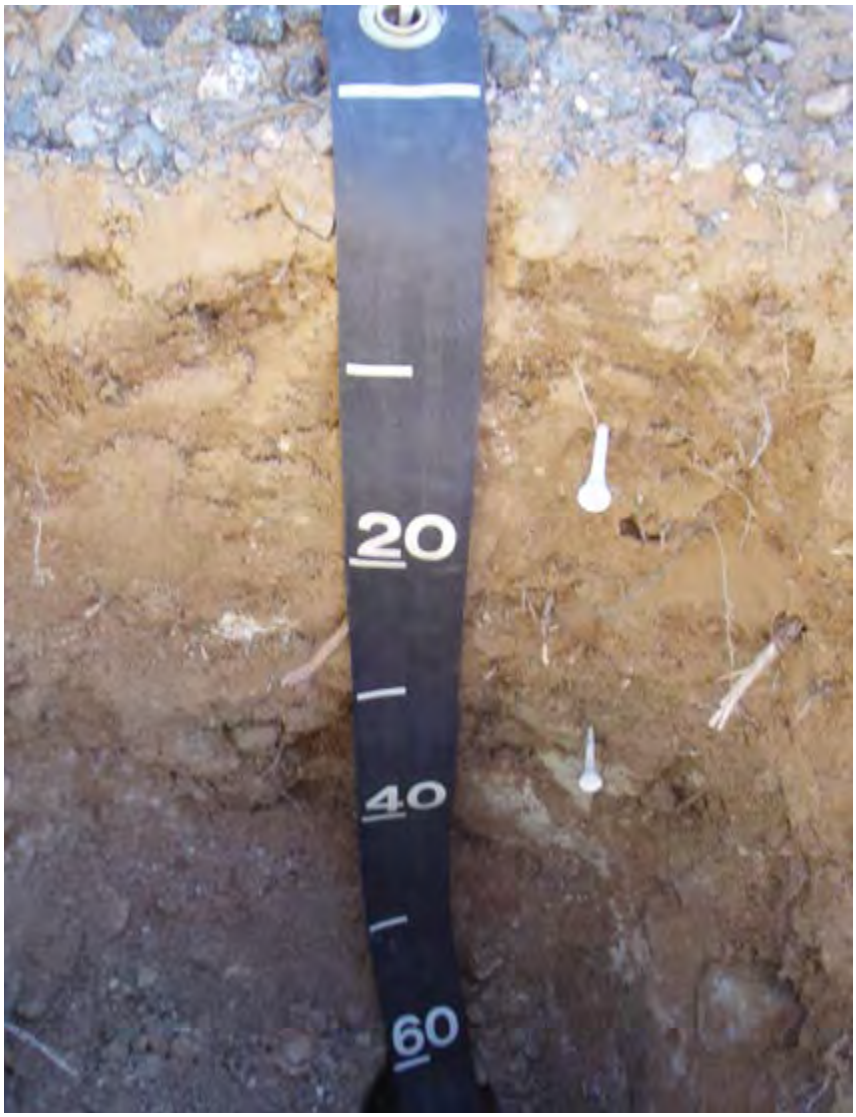

Figure 169.—Profile of the Clapper soil in map unit 42 (Milok-Clapper complex, 2 to 20 percent slopes). The calcic horizon begins at a depth of 36 centimeters. Scale is in centimeters.

Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—15 to 45 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel and cobbles

Description of the Clapper Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids (fig. 169)
Landform: Pediments and plateaus (fig. 170)
Geology: Pediment deposits (Pleistocene and Upper Pliocene)
Parent material: Alluvium derived from basalt
Slope: 2 to 20 percent, northwest to east aspects
Depth to restrictive feature(s): More than 60 inches

Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 6.8 (moderate)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: B
Calcium carbonate content (maximum): About 40 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Stony Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY246UT
Present vegetation (in most areas): Utah juniper, pinyon, blue grama, and galleta
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-15
Rock fragments	25-50
Bare soil	5-50
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 170.—Landscape of the Clapper soil in map unit 42 (Milok-Clapper complex, 2 to 20 percent slopes).

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 468168 meters E., 4261766 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; 18 percent clay; weak very thick platy structure; friable, moderately sticky and moderately plastic; few very fine roots throughout; many very fine irregular pores; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—3.5 to 14 inches (9 to 36 centimeters); brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; 14 percent clay; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; many very fine irregular pores; 8 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—14 to 23 inches (36 to 58 centimeters); light brown (7.5YR 6/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; 19 percent clay; weak medium subangular blocky structure; very firm, moderately sticky and moderately plastic; few very fine roots throughout; many very fine irregular pores; common fine irregular carbonate masses on bottom of rock fragments and common medium irregular carbonate masses in matrix; 40 percent gravel and 5 percent cobbles; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bk2—23 to 71 inches (58 to 180 centimeters); light brown (7.5YR 6/3) very gravelly sandy clay loam, brown (7.5YR 5/4) moist; 20 percent clay; moderate fine subangular blocky structure; friable, moderately sticky and moderately plastic; many very fine irregular pores; common medium irregular carbonate masses in matrix and common medium irregular carbonate masses on bottom of rock fragments; 30 percent gravel and 10 percent cobbles; violently effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content in the particle-size control section: Average of more than 18 percent

A horizon:

Hue—7.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel, cobbles, and stones

Bw horizon:

Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 25 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 60 percent gravel, cobbles, and stones

Bk horizons:

Hue—7.5YR or 10YR
Value—6 to 8 dry; 4 to 8 moist
Chroma—1 to 4 dry; 2 to 4 moist

Figure 171.—Landscape of map unit 43 (Milok, steep-Strych complex, 15 to 60 percent slopes). This map unit is on escarpments bordering Cathedral Valley.

Texture—sandy loam, fine sandy loam, or sandy clay loam
Clay content—10 to 25 percent
Calcium carbonate equivalent—15 to 40 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 60 percent gravel, cobbles, and stones

43—Milok, steep-Strych complex, 15 to 60 percent slopes

Map Unit Setting

General setting: Upper Cathedral Valley (fig. 171)
Major land resource area: 35—Colorado Plateau
Elevation: 6,550 to 7,450 feet (1,997 to 2,272 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Milok, steep and similar soils: 40 percent
Strych and similar soils: 40 percent
Minor components (20 percent) and their ecological sites:
- Very deep, coarse-loamy soils with cambic horizons on escarpments; Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)
- Deep, fine-loamy soils with cambic horizons on side slopes and escarpments; Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)

Figure 172.—Profile of the Milok, steep soil in map unit 43 (Milok, steep-Strych complex, 15 to 60 percent slopes). Scale is in centimeters.

Description of the Milok, Steep Soil

Note: A steep phase is assigned to this soil because it has slopes ranging to 60 percent and is in a very steep ecological site.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids (fig. 172)
Landform: Escarpments (fig. 173)
Geology: Colluvial deposits (Holocene and Pleistocene)
Parent material: Slope alluvium derived from basalt over slope alluvium derived from sandstone
Slope: 15 to 60 percent, southwest to northeast aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 9.9 (high)

Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 40 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)
Ecological site number: R035XY263UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, blue grama, Indian ricegrass, Salina wildrye, and Spanish bayonet
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-15
Rock fragments	35-45
Bare soil	5-15
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 173.—The Milok, steep soil in map unit 43 (Milok, steep-Strych complex, 15 to 60 percent slopes) on escarpments.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 467838 meters E., 4258733 meters N., zone 12

A—0 to 4.5 inches (0 to 12 centimeters); brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; 15 percent clay; weak fine subangular blocky structure; common fine and common very fine roots throughout; many medium, many very fine, and many fine irregular pores; carbonate, finely disseminated; 12 percent gravel; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—4.5 to 15.5 inches (12 to 40 centimeters); brown (7.5YR 5/4) gravelly loam, brown (7.5YR 4/4) moist; 16 percent clay; weak coarse subangular blocky structure; common fine and common medium roots throughout; many medium, many very fine, and many fine irregular pores; common fine irregular carbonate masses in matrix and few fine irregular carbonate masses on bottom of rock fragments; 10 percent gravel and 5 percent cobbles; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk2—15.5 to 71 inches (40 to 180 centimeters); light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; 17 percent clay; weak medium subangular blocky structure; common fine, common medium, and common coarse roots throughout; many medium, many very fine, and many fine irregular pores; common medium irregular carbonate masses in matrix and common medium irregular carbonate masses on bottom of rock fragments; 10 percent gravel and 3 percent cobbles; violently effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel and cobbles

Bk1 horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel, cobbles, and stones

Bk2 horizon:

Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 or 5 moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 40 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel, cobbles, and stones

Figure 174.—Profile of the Strych soil in map unit 43 (Milok, steep-Strych complex, 15 to 60 percent slopes). Scale is in centimeters.

Description of the Strych Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids (fig. 174)
Landform: Escarpments (fig. 175)
Geology: Colluvial deposits (Holocene and Pleistocene)
Parent material: Slope alluvium derived from basalt and/or colluvium derived from basalt
Slope: 15 to 60 percent, northeast aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Figure 175.—The Strych soil in map unit 43 (Milok, steep-Strych complex, 15 to 60 percent slopes) on escarpments.

Available water capacity (total inches): About 4.3 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 40 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)
Ecological site number: R035XY263UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, blue grama, Indian ricegrass, Salina wildrye, and Spanish bayonet
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-15
Rock fragments	35-45
Bare soil	5-15
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 467924 meters E., 4258873 meters N., zone 12

Ak—0 to 5 inches (0 to 13 centimeters); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; 15 percent clay; weak very thick platy structure; common fine and common very fine roots throughout; many medium, many very fine, and many fine irregular pores; few fine irregular carbonate masses on bottom of rock fragments; 9 percent gravel and 5 percent cobbles; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk1—5 to 14 inches (13 to 35 centimeters); brown (7.5YR 5/4) very gravelly loam, brown (7.5YR 4/4) moist; 16 percent clay; moderate medium subangular blocky structure; common very fine, common fine, and common medium roots throughout; many medium, many very fine, and many fine irregular pores; common medium irregular carbonate masses in matrix and common medium irregular carbonate masses on bottom of rock fragments; 25 percent gravel, 10 percent cobbles, and 2 percent stones; violently effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Bk2—14 to 59 inches (35 to 150 centimeters); light brown (7.5YR 6/4) extremely gravelly loam, brown (7.5YR 4/4) moist; 17 percent clay; moderate fine subangular blocky structure; few fine, common medium, and common coarse roots throughout; many medium, many very fine, and many fine irregular pores; common medium irregular carbonate masses in matrix and common medium irregular carbonate masses on bottom of rock fragments; 35 percent gravel, 20 percent cobbles, and 10 percent stones; violently effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A or Ak horizon:

Value—5 to 7 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 35 percent gravel and cobbles

Bk1 horizon:

Value—5 or 6 dry
Texture—sandy loam, fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones

Bk2 horizon:

Hue—7.5YR or 5YR
Value—5 to 7 dry
Texture—sandy loam, fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 40 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones

44—Mivida loamy fine sand, 1 to 4 percent slopes

Map Unit Setting

General setting: Cathedral Valley and the area along the northern boundary of Capitol Reef National Park where it joins Emery County
Major land resource area: 35—Colorado Plateau
Elevation: 5,720 to 6,400 feet (1,745 to 1,951 meters)
Mean annual precipitation: 9 to 12 inches (229 to 305 millimeters)
Mean annual air temperature: 48 to 52 degrees F (8.9 to 11.1 degrees C)
Mean annual soil temperature: 50 to 54 degrees F (10.0 to 12.2 degrees C)
Frost-free period: 130 to 160 days

Map Unit Composition

Mivida and similar soils: 80 percent
Minor components (20 percent) and their ecological sites:
- Begay soils on stream terraces and alluvial fans (very deep, coarse-loamy soils); Semidesert Sandy Loam (Fourwing Saltbush)
- Moderately deep, coarse-loamy soils with calcic horizons on alluvial fans; Semidesert Sandy Loam (Fourwing Saltbush)

Description of the Mivida Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids
Landform: Fan terraces
Geology: Quaternary alluvium
Parent material: Eolian deposits derived from calcareous sandstone over alluvium derived from calcareous sandstone
Slope: 1 to 4 percent, west to south aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 7.6 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Negligible
Hydrologic group: A
Calcium carbonate content (maximum): About 30 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 2 SAR (slightly sodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): Indian ricegrass, fourwing saltbush, needleandthread, galleta, Cutler Mormon tea, winterfat, and gooseberryleaf globemallow
Land capability classification (nonirrigated areas): 7e

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 469863 meters E., 4266343 meters N., zone 12

A—0 to 6.5 inches (0 to 16 centimeters); light brown (7.5YR 6/3) loamy fine sand, brown (7.5YR 4/3) moist; 5 percent clay; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine, common fine, few medium,

and few coarse roots; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; clear wavy boundary.

Bw—6.5 to 22 inches (16 to 56 centimeters); light brown (7.5YR 6/4) loamy fine sand, strong brown (7.5YR 4/6) moist; 8 percent clay; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, few medium, and few coarse roots; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.3; clear wavy boundary.

Bk1—22 to 38 inches (56 to 96 centimeters); pink (7.5YR 7/4) very fine sandy loam, strong brown (7.5YR 5/6) moist; 14 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, and few medium roots; 5 percent gravel; violently effervescent, by HCl, 1 normal; strongly alkaline, pH 8.6; gradual wavy boundary.

Bk2—38 to 43 inches (96 to 109 centimeters); pink (7.5YR 7/4) gravelly fine sandy loam, light brown (7.5YR 6/4) moist; 14 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and common very fine roots; 20 percent gravel; violently effervescent, by HCl, 1 normal; strongly alkaline, pH 8.6; clear wavy boundary.

C1—43 to 64 inches (109 to 162 centimeters); pink (7.5YR 7/3) loamy sand, brown (7.5YR 5/3) moist; 6 percent clay; single grain; loose, nonsticky and nonplastic; few very fine roots; 5 percent gravel; strongly effervescent, by HCl, 1 normal; strongly alkaline, pH 8.6; clear wavy boundary.

C2—64 to 72.5 inches (162 to 184 centimeters); light brown (7.5YR 6/3) gravelly fine sandy loam, light brown (7.5YR 6/4) moist; 11 percent clay; single grain; loose, slightly sticky and slightly plastic; few very fine roots; 20 percent gravel and 8 percent cobbles; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:
Value—4 to 6, dry or moist
Chroma—3 or 4, dry or moist

Bw horizon:
Hue—5YR or 7.5YR
Value—6 or 7 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or very fine sandy loam

Bk horizon:
Hue—5YR or 7.5YR
Value—6 or 7 dry; 5 or 6 moist
Chroma—3 to 6, dry or moist

C horizon:
Value—6 or 7 dry; 4 or 6 moist
Chroma—3 to 6, dry or moist
Texture—loamy sand or fine sandy loam
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

45—Mivida-Gish-Cannonville complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Top of Burr Trail and an area below the Circle Cliffs
Major land resource area: 35—Colorado Plateau

Elevation: 5,670 to 5,780 feet (1,727 to 1,761 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Mivida and similar soils: 50 percent
Gish and similar soils: 15 percent
Cannonville and similar soils: 15 percent
Minor components (20 percent) and their ecological sites:
- Very deep, loamy-skeletal soils on alluvial flats; Alkali Bottom (Greasewood)
- Very deep, loamy-skeletal soils with calcic horizons on hills; Semidesert Sandy Loam (Fourwing Saltbush)
- Begay, moist soils on terraces (very deep, sandy loam soils); Semidesert Sandy Loam (Wyoming Big Sagebrush)

Description of the Mivida Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids
Landform: Alluvial flats (fig. 176)
Geology: Alluvium and slope alluvium (Quaternary)
Parent material: Eolian deposits derived from sandstone and/or slope alluvium derived from sandstone
Slope: 2 to 6 percent, north aspect
Depth to restrictive feature(s): More than 60 inches

Figure 176.—The Mivida soil in map unit 45 (Mivida-Gish-Cannonville complex, 2 to 15 percent slopes) on alluvial flats.

Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 8.9 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: A
Calcium carbonate content (maximum): About 40 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): Galleta, blue grama, fourwing saltbush, Utah juniper, and Indian ricegrass
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	40-55
Litter (<5 mm)	0-5
Rock fragments	15-25
Bare soil	20-30
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 496687 meters E., 4189258 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; 15 percent clay; weak thick platy structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine vesicular pores; very slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bw—4 to 22 inches (10 to 56 centimeters); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; 16 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common fine and common very fine roots throughout; common very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk1—22 to 33.5 inches (56 to 85 centimeters); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; 17 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common fine and common very fine roots throughout; common very fine irregular pores; common coarse irregular carbonate masses in matrix; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk2—33.5 to 47 inches (85 to 120 centimeters); pink (5YR 7/4) fine sandy loam, light reddish brown (5YR 6/4) moist; 17 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; many medium irregular carbonate masses in matrix; violently effervescent; strongly alkaline, pH 8.6; clear wavy boundary.

Bk3—47 to 59 inches (120 to 150 centimeters); pink (5YR 7/4) fine sandy loam, light reddish brown (5YR 6/4) moist; 14 percent clay; weak coarse subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; common medium irregular carbonate masses in matrix; violently effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

A horizon:
Hue—5YR or 7.5YR
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or very fine sandy loam
Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 5 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw horizon:
Hue—5YR or 7.5YR
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or very fine sandy loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 5 percent gravel

Upper Bk horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or very fine sandy loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Rock fragments—0 to 5 percent gravel

Lower Bk horizon:
Hue—5YR or 7.5YR
Value—6 to 8 dry; 4 to 7 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, or very fine sandy loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—15 to 40 percent
SAR—0 to 5
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Gish Soil

Taxonomic classification: Fine, mixed, superactive, mesic Sodic Ustic Haplocambids (fig. 177)
Landform: Alluvial flats (fig. 178)
Geology: Alluvium and slope alluvium (Quaternary)
Parent material: Slope alluvium derived from sandstone and shale
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 7.9 (high)
Shrink-swell potential: About 7.5 LEP (high)

Figure 177.—Profile of the Gish soil in map unit 45 (Mivida-Gish-Cannonville complex, 2 to 15 percent slopes). The natric horizon begins at a depth of about 26 centimeters. Scale is in centimeters.

Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: C
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 30 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Alkali Bottom (Greasewood)
Ecological site number: R035XY003UT
Present vegetation (in most areas): Greasewood, alkali sacaton, Indian ricegrass, rubber rabbitbrush, fourwing saltbush, and Pursh seepweed
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-15

Figure 178.—The Gish soil in map unit 45 (Mivida-Gish-Cannonville complex, 2 to 15 percent slopes) on alluvial flats.

Rock fragments	0-5
Bare soil	30-45
Cyanobacteria crust	2-10
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 496544 meters E., 4189415 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; 25 percent clay; moderate thick platy structure parting to moderate thin platy; slightly hard, friable, slightly sticky and slightly plastic; common fine roots throughout; many very fine vesicular pores; 2 percent gravel; violently effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bk—3.5 to 9 inches (9 to 23 centimeters); yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; 24 percent clay; moderate very coarse prismatic structure parting to moderate very thick platy; hard, very firm, slightly sticky and slightly plastic; common fine roots throughout; many very fine vesicular pores; common fine irregular carbonate masses in matrix; 3 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bkn—9 to 24 inches (23 to 61 centimeters); strong brown (7.5YR 5/6) silty clay loam, strong brown (7.5YR 4/6) moist; 36 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic;

common fine roots throughout; common very fine irregular pores; common fine irregular carbonate masses in matrix; strongly effervescent; strongly alkaline, pH 8.6; clear wavy boundary.

Bnz1—24 to 45.5 inches (61 to 115 centimeters); strong brown (7.5YR 5/6) silty clay, strong brown (7.5YR 4/6) moist; 41 percent clay; moderate medium subangular blocky structure; hard, very firm, very sticky and very plastic; common fine roots throughout; common very fine irregular pores; common fine irregular salt masses in matrix; strongly effervescent; strongly alkaline, pH 8.8; clear wavy boundary.

Bnz2—45.5 to 55.5 inches (115 to 141 centimeters); strong brown (7.5YR 5/6) silty clay loam, strong brown (7.5YR 4/6) moist; 30 percent clay; weak medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common fine roots throughout; common very fine irregular pores; common fine irregular salt masses in matrix; strongly effervescent; strongly alkaline, pH 8.8; clear wavy boundary.

Cnz1—55.5 to 63 inches (141 to 160 centimeters); brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4) moist; 41 percent clay; massive; moderately hard, firm, very sticky and very plastic; common fine roots throughout; common very fine irregular pores; common medium irregular salt masses in matrix; 1 percent gravel; strongly effervescent; strongly alkaline, pH 8.6; clear wavy boundary.

Cnz2—63 to 71 inches (160 to 180 centimeters); strong brown (7.5YR 5/6) silt loam, strong brown (7.5YR 4/6) moist; 26 percent clay; massive; slightly hard, firm, moderately sticky and slightly plastic; common fine roots throughout; common very fine irregular pores; common fine irregular salt masses in matrix; 1 percent gravel; violently effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

A horizon:

Clay content—20 to 27 percent
Calcium carbonate equivalent—5 to 15 percent
Rock fragments—0 to 5 percent gravel

Bk and Bkn horizons:

Hue—5YR or 7.5YR
Texture—loam, silty clay loam, or silty clay
Clay content—20 to 45 percent
Calcium carbonate equivalent—5 to 15 percent
Rock fragments—0 to 5 percent gravel

Bnz horizons:

Texture—silty clay loam or silty clay
Clay content—30 to 45 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—10 to 20
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 5 percent gravel

Cnz horizons:

Value—4 or 5, dry or moist
Chroma—4 or 6, dry or moist
Texture—silt loam, silty clay loam, or silty clay
Clay content—20 to 45 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—10 to 20
Electrical conductivity—16 to 30 mmhos/cm
Rock fragments—0 to 5 percent gravel

Figure 179.—Profile of the Cannonville soil in map unit 45 (Mivida-Gish-Cannonville complex, 2 to 15 percent slopes). The cracks are due to the soil's high clay content. Scale is in centimeters.

This Gish soil is mapped as a taxadjunct to the Gish series because it has an exchangeable sodium percentage of more than 15 and is classified as a Sodic Ustic Haplocambid. The Gish series is classified as an Ustic Haplocambid. In addition, the Gish soil in this map unit has hue of 7.5YR and redder throughout the profile whereas the Gish series has hue of 10YR and 2.5Y.

Description of the Cannonville Soil

Taxonomic classification: Fine, smectitic, mesic Ustic Haplocambids (fig. 179)
Landform: Hills (fig. 180)
Geology: Chinle Formation (Triassic)
Parent material: Residuum weathered from shale

Slope: 6 to 15 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 3.3 (low)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Semidesert Shallow Clay (Shadscale-Utah Juniper)
Ecological site number: R035XY239UT
Present vegetation (in most areas): Broom snakeweed, galleta, Utah juniper, and shadscale
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	20-35
Litter (<5 mm)	5-10
Rock fragments	20-35
Bare soil	20-35
Cyanobacteria crust	0

Figure 180.—The Cannonville soil in map unit 45 (Mivida-Gish-Cannonville complex, 2 to 15 percent slopes) on hills.

Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 496755 meters E., 4189174 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; 32 percent clay; moderate medium subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common fine roots throughout; many very fine irregular pores; 10 percent channers; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bw—4 to 13.5 inches (10 to 34 centimeters); brown (10YR 5/3) clay, brown (10YR 4/3) moist; 50 percent clay; strong coarse prismatic structure parting to moderate medium subangular blocky; hard, very firm, very sticky and very plastic; common fine and common very fine roots throughout; common very fine irregular pores; slightly effervescent; strongly alkaline, pH 8.8; gradual wavy boundary.

Cyz—13.5 to 30.5 inches (34 to 77 centimeters); 10 percent yellowish brown (10YR 5/4), 10 percent pale olive (5Y 6/3), and 80 percent brown (10YR 4/3) clay, 10 percent dark yellowish brown (10YR 4/4), 10 percent olive (5Y 5/3), and 80 percent dark brown (10YR 3/3) moist; 41 percent clay; massive; hard, very firm, very sticky and very plastic; few fine and few very fine roots throughout; common very fine irregular pores; few fine irregular salt masses in matrix and few fine irregular gypsum masses in matrix; very slightly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Cr—30.5 to 40 inches (77 to 102 centimeters); moderately cemented shale.

Range in Characteristics

A horizon:

Value—4 or 5, dry or moist
Clay content—27 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 15 percent channers

Bw horizon:

Value—4 or 5, dry or moist
Clay content—40 to 50 percent
Calcium carbonate equivalent—1 to 3 percent
SAR—10 to 20
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent parachanners

Cz horizon:

Hue—5Y or 10YR
Value—4 to 6 dry; 3 to 5 moist
Clay content—40 to 50 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 5 percent parachanners

This Cannonville soil is mapped as a taxadjunct to the Cannonville series because it contains a cambic horizon, is moderately deep to a paralithic contact, and is classified

as an Ustic Haplocambid. The Cannonville series lacks a cambic horizon, has shale bedrock within a depth of 50 centimeters, and is classified as a shallow Ustic Torriorthent.

46—Moab-Abra family complex, 1 to 12 percent slopes

Map Unit Setting

General setting: Areas throughout Capitol Reef National Park
Major land resource area: 35—Colorado Plateau
Elevation: 5,250 to 6,620 feet (1,600 to 2,019 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Moab and similar soils: 60 percent
Abra family and similar soils: 30 percent
Minor components (10 percent) and their ecological sites:
Very deep, coarse-loamy soils with calcic horizons on remnant alluvial fans; Semidesert Loam (Shadscale)

Description of the Moab Soil

Note: This soil has a mean annual soil temperature as low as 48 degrees F, which is cooler than is typical of the Moab series. The Moab series typically has a mean annual soil temperature of 54 to 57 degrees F.

Taxonomic classification: Loamy-skeletal, carbonatic, mesic Ustic Haplocalcids (fig. 181)
Landform: Fan remnants and pediments (fig. 182)
Geology: Alluvium and pediment deposits (Quaternary)
Parent material: Alluvium derived from sandstone and/or alluvium derived from basalt
Slope: 2 to 12 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 4.2 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 50 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Loam (Shadscale)
Ecological site number: R035XY242UT
Present vegetation (in most areas): Galleta, shadscale, broom snakeweed, desert needlegrass, Indian ricegrass, phacelia, sand dropseed, and Torrey's jointfir
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	50-10

Figure 181.—Profile of the Moab soil in map unit 46 (Moab-Abra family complex, 1 to 12 percent slopes). The light-colored calcic horizon is below a depth of 20 centimeters. Scale is in centimeters.

Rock fragments	0-25
Bare soil	35-60
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477955 meters E., 4255018 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); brown (7.5YR 5/4) gravelly sandy loam, dark reddish brown (5YR 3/4) moist; 13 percent clay; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine irregular pores; 20 percent gravel, 5 percent cobbles, and 5 percent stones; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk1—3.5 to 8.5 inches (9 to 21 centimeters); reddish brown (5YR 5/4) very stony sandy loam, dark reddish brown (5YR 3/4) moist; 16 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; many very fine and many fine irregular pores; common fine irregular carbonate masses in matrix and common medium irregular carbonate masses on bottom of rock fragments; 20 percent gravel, 15 percent cobbles, and 10 percent stones; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk2—8.5 to 17 inches (21 to 43 centimeters); pinkish white (7.5YR 8/2) extremely stony sandy loam, light gray (10YR 7/2) moist; 17 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, and few medium roots throughout; common very fine irregular pores; many coarse irregular carbonate masses in matrix and many very coarse irregular carbonate masses on bottom of rock fragments; 25 percent gravel, 10 percent cobbles, and 30 percent stones; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bk3—17 to 71 inches (43 to 180 centimeters); light brown (7.5YR 6/3) very stony sandy loam, brown (7.5YR 5/3) moist; 18 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; common very fine irregular pores; common medium irregular

Figure 182.—The Moab soil in map unit 46 (Moab-Abra family complex, 1 to 12 percent slopes) on remnant fan terraces.

carbonate masses on bottom of rock fragments; 20 percent gravel, 10 percent cobbles, and 20 percent stones; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Clay content in the particle-size control section: Average of less than 18 percent

A horizon:
Hue—7.5YR or 5YR
Value—5 or 6 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 35 percent gravel, cobbles, and stones

Bk1 horizon:
Hue—7.5YR or 5YR
Value—5 or 6 dry; 3 to 5 moist
Texture—sandy loam or loam
Clay content—10 to 20 percent
Calcium carbonate equivalent—15 to 30 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones

Bk2 horizon:
Hue—7.5YR or 10YR
Chroma—2 or 3, dry or moist
Texture—sandy loam or loam
Clay content—10 to 20 percent
Calcium carbonate equivalent—30 to 50 percent
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bk3 horizon:
Hue—7.5YR or 10YR
Value—5 to 7, dry or moist
Texture—sandy loam or loam
Clay content—10 to 20 percent
Calcium carbonate equivalent—15 to 30 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones

Description of the Abra Family Soil

Note: This soil is correlated at the family level because it is deep to a lithic contact and has horizons with more than 35 percent rock fragments. The Abra series does not have a lithic contact within a depth of 150 centimeters nor more than 35 percent rock fragments in any horizon.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocalcids (fig. 183)
Landform: Fan remnants and pediments (fig. 184)
Geology: Alluvium and pediment deposits (Quaternary)
Parent material: Alluvium derived from sandstone and/or alluvium derived from basalt
Slope: 1 to 5 percent, north aspect

Figure 183.—Profile of the Abra family soil in map unit 46 (Moab-Abra family complex, 1 to 12 percent slopes). Scale is in centimeters.

Depth to restrictive feature(s): Lithic bedrock at a depth of 40 to 60 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 6.9 (moderate)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: B
Calcium carbonate content (maximum): About 40 percent (fig. 185)
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Loam (Shadscale)
Ecological site number: R035XY242UT
Present vegetation (in most areas): Galleta, shadscale, broom snakeweed, desert needlegrass, Indian ricegrass, phacelia, sand dropseed, and Torrey's jointfir
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	5-10
Rock fragments	0-25
Bare soil	35-60
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 184.—The Abra family soil in map unit 46 (Moab-Abra family complex, 1 to 12 percent slopes) on remnant fan terraces and pediments.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477727 meters E., 4255013 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); light brown (7.5YR 6/3) loam, brown (7.5YR 4/4) moist; 18 percent clay; moderate very thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; many very fine and many fine vesicular pores; 2 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—3.5 to 13 inches (9 to 33 centimeters); light brown (7.5YR 6/4) loam, strong brown (7.5YR 4/6) moist; 18 percent clay; weak coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and few very fine roots throughout; common very fine and common fine irregular pores; 3 percent gravel; strongly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Bk1—13 to 36 inches (33 to 92 centimeters); pinkish white (7.5YR 8.5/2) loam, pink (7.5YR 7/3) moist; 25 percent clay; weak medium subangular blocky structure; hard, firm, moderately sticky and slightly plastic; few fine and few very fine roots throughout; many very fine irregular pores; many coarse irregular carbonate masses in matrix; 3 percent gravel; violently effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Bk2—36 to 46 inches (92 to 117 centimeters); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; 13 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and few very fine roots throughout; common very fine irregular pores; many medium irregular carbonate masses in matrix;

10 percent gravel; strongly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

R—46 to 56 inches (117 to 142 centimeters); strongly cemented siltstone.

Range in Characteristics

Clay content in the particle-size control section: Average of more than 18 percent

Rock fragment content in the particle-size control section: Average of less than 35 percent

A horizon:

Hue—7.5YR or 5YR

Value—4 to 6, dry or moist

Figure 185.—A light-colored calcic horizon from an auger sample of the Abra family soil.

Chroma—3 to 6, dry or moist
Texture—sandy loam or loam
Clay content—12 to 20 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel

Bw or AB horizon:
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or loam
Clay content—15 to 25 percent
Calcium carbonate equivalent—5 to 15 percent
SAR—0 to 5
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel

Bk1 horizon:
Value—6 to 9 dry; 6 or 7 moist
Chroma—1 to 3 dry; 3 or 4 moist
Texture—sandy loam or loam
Clay content—15 to 28 percent
Calcium carbonate equivalent—15 to 40 percent
SAR—0 to 5
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 15 percent gravel and cobbles
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bk2 horizon:
Value—6 to 8 dry; 4 to 6 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—sandy loam or loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—10 to 40 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 45 percent gravel and cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

47—Moclom, warm-Rock outcrop complex, 6 to 20 percent slopes

Map Unit Setting

General setting: Strike Valley (fig. 186)
Major land resource area: 35—Colorado Plateau
Elevation: 4,890 to 5,550 feet (1,490 to 1,691 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 48 to 55 degrees F (9.0 to 13.0 degrees C)
Mean annual soil temperature: 50 to 57 degrees F (10.1 to 14.1 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Moclom, warm and similar soils: 45 percent
Rock outcrop, Summerville Formation sandstone and conglomerate: 30 percent

Figure 186.—Landscape of map unit 47 (Moclom, warm-Rock outcrop complex, 6 to 20 percent slopes) on dip slopes of cuestas.

Minor components (15 percent) and their ecological sites:

Eslendo, saline soils on hills and dip slopes of cuestas (shallow, clayey soils); Desert Clay (Castle Valley Saltbush)

Querencia, saline-sodic soils on toeslopes of scarp slopes (very deep, fine-loamy soils); Desert Loam (Shadscale)

Begay family soils on hills (very deep, coarse-loamy soils with cambic horizons); Semidesert Sandy Loam (Fourwing Saltbush)

Lybrook, saline-sodic soils on hills (moderately deep, clayey soils); Semidesert Shallow Clay (Shadscale-Utah Juniper)

Begay, moist soils on dip slopes of cuestas (very deep, coarse-loamy soils with cambic horizons); Semidesert Sandy Loam (Wyoming Big Sagebrush)

Description of the Moclom, Warm Soil

Note: A warm phase is assigned to this soil to account for the blackbrush ecological site.

Taxonomic classification: Mixed, mesic Lithic Torripsamments
Landform: Dip slopes of cuestas or hogbacks
Geology: Morrison Formation (Jurassic), Salt Wash Member
Parent material: Eolian deposits derived from sandstone and/or slope alluvium derived from sandstone
Slope: 6 to 20 percent, southwest to northeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 6 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 0.5 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Very rare

Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: D
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sand (Blackbrush)
Ecological site number: R035XY224UT
Present vegetation (in most areas): Blackbrush, galleta, Indian ricegrass, and Utah juniper
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	10-20
Rock fragments	5-10
Bare soil	15-25
Cyanobacteria crust	25-35
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 501352 meters E., 4187890 meters N., zone 12

AC—0 to 2 inches (0 to 5 centimeters); very pale brown (10YR 7/4) gravelly loamy sand, light yellowish brown (10YR 6/4) moist; 7 percent clay; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and common medium roots throughout; common fine irregular pores; 15 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt wavy boundary.

C—2 to 8.5 inches (5 to 22 centimeters); very pale brown (10YR 7/4) gravelly loamy sand, light yellowish brown (10YR 6/4) moist; 9 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine and common very fine roots throughout; common fine irregular pores; 15 percent gravel; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt smooth boundary.

R—8.5 to 18.5 inches (22 to 47 centimeters); very strongly cemented sandstone.

Range in Characteristics

AC horizon:
Hue—2.5YR, 5YR, or 10YR
Value—6 or 7 dry; 4 to 6 moist
Chroma—3 or 4 dry; 4 or 6 moist
Texture—sandy loam or loamy sand
Clay content—5 to 15 percent
Calcium carbonate equivalent—2 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon:
Hue—2.5YR or 10YR
Value—5 or 6 dry; 3 to 6 moist

Chroma—3 or 4 dry; 3 to 6 moist
Texture—sandy loam or loamy sand
Clay content—5 to 15 percent
Calcium carbonate equivalent—1 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Rock Outcrop, Summerville Formation Sandstone and Conglomerate

This component is characterized by nearly level to strongly sloping rock outcrop with discontinuous cliffs and escarpments. The lithology is sandstone and sandstone conglomorate. The vertical relief is commonly a few feet, and the continuity of the cliffs is broken. Typically, there are enough cliffs to impede vehicular travel to some degree. The area can be negotiated by full-sized four-wheeled vehicles with difficulty. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

48—Moenkopie, warm-Rock outcrop complex, 2 to 35 percent slopes

Map Unit Setting

General setting: Areas along Halls Creek (fig. 187)
Major land resource area: 35—Colorado Plateau
Elevation: 3,920 to 4,410 feet (1,196 to 1,343 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Moenkopie, warm and similar soils: 60 percent
Rock outcrop, Carmel Formation sandstone: 20 percent
Minor components (20 percent) and their ecological sites:
Moffat soils on hills and structural benches (deep and very deep, coarse-loamy soils); Desert Sandy Loam (Blackbrush)

Description of the Moenkopie, Warm Soil

Note: A warm phase is assigned to this soil to account for the blackbrush ecological site.

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Torriorthents (fig. 188)
Landform: Structural benches and low hills
Geology: Carmel Formation sandstone (Jurassic)
Parent material: Residuum weathered from sandstone and siltstone
Slope: 2 to 35 percent, north to northwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained

Figure 187.—Landscape of map unit 48 (Moenkopie, warm-Rock outcrop complex, 2 to 35 percent slopes). This map unit is on low hills and structural benches near Halls Creek.

Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Shallow Sandy Loam (Blackbrush)
Ecological site number: R035XY133UT
Present vegetation (in most areas): Blackbrush, galleta, shadscale, and Torrey's jointfir
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	20-35
Litter (<5 mm)	2-10
Rock fragments	0
Bare soil	20-45
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 510373 meters E., 4164556 meters N., zone 12

A—0 to 1.5 inches (0 to 4 centimeters); yellowish red (5YR 5/6) very gravelly fine sandy loam, yellowish red (5YR 4/6) moist; 11 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots throughout; common very fine irregular pores; 40 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C—1.5 to 6.5 inches (4 to 17 centimeters); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; 16 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine, few fine, and few medium roots throughout; common very fine irregular pores; 10 percent parachanners; slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

R—6.5 to 16.5 inches (17 to 42 centimeters); very strongly cemented sandstone.

Range in Characteristics

A horizon:

Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—0 to 40 percent gravel

Figure 188.—Profile of the Moenkopie, warm soil in map unit 48 (Moenkopie, warm-Rock outcrop complex, 2 to 35 percent slopes). Bedrock is at a depth of 17 centimeters. Scale is in centimeters.

C horizon or Ck horizon (if it occurs):
Hue—5YR or 2.5YR
Chroma—4 or 6, dry or moist
Texture—very fine sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—10 to 55 percent parachanners or gravel

Description of the Rock Outcrop, Carmel Formation Sandstone

This component is characterized by gently sloping to steep rock outcrop. The lithology is sandstone. Typically, there are very few nearly vertical cliffs to impede vehicular travel. The vertical relief typically ranges from a few feet to several feet. Due to the steepness of slopes, the area can be negotiated by full-sized four-wheeled vehicles with care. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

49—Moenkopie-Rock outcrop complex, 3 to 24 percent slopes

Map Unit Setting

General setting: Sites adjacent to Glen Canyon National Recreation Area along Halls Creek
Major land resource area: 35—Colorado Plateau
Elevation: 3,700 to 4,640 feet (1,128 to 1,414 meters)
Mean annual precipitation: 6 to 10 inches (150 to 250 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days

Map Unit Composition

Moenkopie and similar soils: 60 percent
Rock outcrop: 30 percent
Minor components (10 percent):
Moderately deep, coarse-loamy soils with calcic horizons on hills, mesas, and structural benches (desert, mesic)
Shallow and moderately deep soils with more than 18 percent clay on hills and structural benches (desert, mesic)

Description of the Moenkopie Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Torriorthents
Landform: Interfluves on hills, mesas, and structural benches
Geology: Entrada Sandstone (Jurassic)
Parent material: Eolian sands derived from sandstone and/or residuum weathered from sandstone and shale
Slope: 3 to 24 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 14 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 0.8 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None

Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Desert Shallow Sandy Loam (Shadscale)
Ecological site number: R035XY130UT
Present vegetation (in most areas): Shadscale saltbush, blackbrush, pricklypear, Indian ricegrass, Cutler Mormon tea, and galleta
Land capability classification (nonirrigated areas): 7c
Ground cover (percent):

Plant canopy	10
Litter (<5 mm)	27
Rock fragments	33
Bare soil	36
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 540772 meters E., 4166134 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; 7 percent clay; weak thin platy structure; loose, nonsticky and nonplastic; common very fine roots throughout; many very fine dendritic tubular pores; 7 percent gravel; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; abrupt smooth boundary.

C1—2 to 5 inches (5 to 13 centimeters); red (2.5YR 5/6) loam, dark red (2.5YR 3/6) moist; 17 percent clay; massive; soft, very friable, slightly sticky and nonplastic; many very fine roots throughout; many very fine dendritic tubular pores; 10 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—5 to 8 inches (13 to 20 centimeters); reddish brown (2.5YR 5/4) gravelly sandy loam, reddish brown (2.5YR 4/4) moist; 12 percent clay; massive; loose, nonsticky and nonplastic; many fine and common medium roots throughout; common very fine dendritic tubular pores; 30 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; abrupt wavy boundary.

R—8 to 18 inches (20 to 46 centimeters); unweathered, unfractured sandstone.

Range in Characteristics

Reaction: pH 7.4 to 8.4 (slightly alkaline or moderately alkaline)

A horizon:
Hue—7.5YR, 5YR, or 2.5YR
Value—5 to 6 dry; 4 to 6 moist
Chroma—4 or 6, dry or moist

C horizon:
Hue—5YR or 2.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist

Texture—loam, sandy loam, or fine sandy loam
Clay content—10 to 18 percent
Rock fragments—0 to 30 percent gravel

Description of the Rock Outcrop

This component consists of interbedded sandstone and shale bedrock that is typically exposed along ledges and slick rock areas of the Kayenta or Morrison Formation. It also includes areas where the depth to bedrock is less than 4 inches (10 centimeters).

50—Molen family-Lazear-Gerst complex, 2 to 8 percent slopes

Map Unit Setting

General setting: Join unit with the soil survey of Emery County at its north-central boundary with Capitol Reef National Park
Major land resource area: 34—Central Desertic Basins, Mountains, and Plateaus
Elevation: 5,200 to 6,800 feet (1,585 to 2,073 meters)
Mean annual precipitation: 9 to 12 inches (229 to 305 millimeters)
Mean annual air temperature: 45 to 50 degrees F (7.2 to 10.0 degrees C)
Mean annual soil temperature: 47 to 52 degrees F (8.3 to 11.1 degrees C)
Frost-free period: 120 to 150 days

Map Unit Composition

Molen family and similar soils: 50 percent
Lazear and similar soils: 18 percent
Gerst and similar soils: 15 percent
Minor components (17 percent) and their ecological sites:
- Moderately deep, coarse-loamy soils with calcic horizons on mesas and structural benches; Semidesert Sandy Loam (Fourwing Saltbush)
- Very deep, fine-loamy soils with calcic horizons on fan remnants; Semidesert Loam (Wyoming Big Sagebrush)
- Very shallow, loamy soils with calcic horizons on structural benches under shadscale, Salina wildrye, and galleta

Description of the Molen Family Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau whereas the Molen series occurs in MLRA 34B—Warm Central Desertic Basins and Plateaus.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocalcids
Landform: Structural benches
Geology: Curtis, Summerville, and Entrada Formations (Jurassic)
Parent material: Eolian deposits over residuum weathered from sandstone and shale
Slope: 2 to 6 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 4.3 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches

Runoff class: Low
Hydrologic group: C
Calcium carbonate content (maximum): About 35 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (maximum): About 4 SAR (slightly sodic)
Ecological site name: Semidesert Loam (Salina wildrye)
Ecological site number: R034XY209UT
Present vegetation (in most areas): Salina wildrye and galleta
Land capability classification (nonirrigated areas): 7e

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477485 meters E., 4297504 meters N., zone 12

A—0 to 3 inches (0 to 8 centimeters); pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; 10 percent clay; weak thin platy structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; common very fine, common fine, common medium, and few coarse roots; many very fine tubular, many very fine interstitial, and few fine tubular pores; 2 percent gravel; slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear wavy boundary.

Bw—3 to 7.5 inches (8 to 19 centimeters); light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; 15 percent clay; weak fine and weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, common medium, and few coarse roots; many very fine interstitial, many very fine tubular, and few fine tubular pores; 2 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 7.9; gradual wavy boundary.

Bk—7.5 to 12 inches (19 to 31 centimeters); light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; 16 percent clay; weak medium and weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, common medium, and few coarse roots; common medium, few coarse, common very fine, and common fine tubular pores; common fine threadlike carbonate masses; 2 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.4; clear wavy boundary.

2Bk1—12 to 17 inches (31 to 43 centimeters); very pale brown (10YR 7/4) loam, brown (10YR 5/3) moist; 24 percent clay; weak medium and weak fine subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; common very fine, common fine, and common medium roots; common medium tubular, few coarse tubular, common very fine tubular, common fine vesicular, and common fine tubular pores; common distinct carbonate coats on rock fragments; common fine and common coarse threadlike carbonate masses; 5 percent gravel; violently effervescent, by HCl, 1 normal; strongly alkaline, pH 8.5; clear wavy boundary.

2Bk2—17 to 21.5 inches (43 to 54 centimeters); pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; 23 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; few fine and common very fine roots; common medium tubular, few coarse tubular, common very fine tubular, and few fine vesicular pores; common fine threadlike carbonate masses; 5 percent gravel; violently effervescent, by HCl, 1 normal; strongly alkaline, pH 8.7; clear wavy boundary.

2BCky—21.5 to 31 inches (54 to 79 centimeters); light yellowish brown (2.5Y 6/3) channery sandy clay loam, grayish brown (2.5Y 5/2) moist; 23 percent clay; weak thin platy, weak medium angular blocky, and weak fine angular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; few fine and common very fine roots; few very fine tubular, few fine tubular, few fine interstitial, and few

fine vesicular pores; common distinct carbonate coats on rock fragments; common fine threadlike carbonate masses and common fine irregular gypsum masses; 10 percent parachanners and 10 percent channers; strongly effervescent, by HCl, 1 normal; strongly alkaline, pH 8.5; abrupt wavy boundary.

R—31 to 35 inches (79 to 89 centimeters); indurated sandstone.

Range in Characteristics

A horizon:

Hue—7.5YR or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 to 4
Texture—fine sandy loam or loam
Clay content—6 to 27 percent
Calcium carbonate equivalent—2 to 15 percent
Gypsum content—0 to 5 percent
SAR—0 to 5
Electrical conductivity—0 to 8 mmhos/cm
Rock fragments—0 to 60 percent gravel, cobbles, and stones
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw horizon:

Hue—7.5YR or 10YR
Value—5 or 6 dry; 4 to 6 moist
Chroma—3 or 4
Texture—loam or fine sandy loam
Clay content—8 to 27 percent
Calcium carbonate equivalent—2 to 15 percent
Gypsum content—0 to 5 percent
SAR—0 to 5
Electrical conductivity—0 to 8 mmhos/cm
Rock fragments—0 to 35 percent gravel, cobbles, and stones
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bk, BCk, and 2Bk horizons:

Hue—10YR or 2.5Y
Value—6 to 8 dry; 4 to 6 moist
Chroma—2 to 4
Texture—loam or fine sandy loam
Clay content—12 to 35 percent
Calcium carbonate equivalent—15 to 45 percent
Gypsum content—0 to 5 percent
SAR—0 to 5
Electrical conductivity—0 to 8 mmhos/cm
Rock fragments—0 to 35 percent gravel, cobbles, and stones
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

2BCky horizon:

Hue—10YR or 2.5Y
Value—5 to 7 dry; 4 to 6 moist
Chroma—2 to 4
Texture—loam or sandy clay loam
Clay content—20 to 30 percent
Calcium carbonate equivalent—10 to 25 percent
Gypsum content—1 to 5 percent
SAR—0 to 4
Electrical conductivity—0 to 8 mmhos/cm

Rock fragments—0 to 30 percent gravel or channers
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Lazear Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Structural benches
Geology: Curtis, Summerville, and Entrada Formations (Jurassic)
Parent material: Slope alluvium over residuum weathered from sandstone and shale
Slope: 2 to 8 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 10 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 2.1 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R034XY233UT
Present vegetation (in most areas): Black sagebrush, Salina wildrye, bluebunch wheatgrass, galleta, twoneedle pinyon, Utah juniper, and roughseed cryptantha
Land capability classification (nonirrigated areas): 7e

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 533354 meters E., 4365877 meters N., zone 12

A—0 to 3 inches (0 to 8 centimeters); pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; 21 percent clay; weak medium platy and weak thick platy structure; soft, very friable, slightly sticky and slightly plastic; common very fine, common fine, common medium, and few coarse roots; carbonate, finely disseminated; 25 percent gravel and 3 percent cobbles; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C1—3 to 7 inches (8 to 18 centimeters); light yellowish brown (10YR 6/4) gravelly loam, brown (7.5YR 4/4) moist; 24 percent clay; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, common medium, and few coarse roots; carbonate, finely disseminated; 15 percent gravel and 5 percent cobbles; strongly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C2—7 to 14 inches (18 to 36 centimeters); yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; 20 percent clay; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine, few fine, and few medium roots; carbonate, finely disseminated; 10 percent gravel and 3 percent cobbles; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

R—14 inches (36 centimeters); indurated sandstone.

Range in Characteristics

A horizon:
Hue—7.5YR or 10YR

Value—5 to 7 dry; 3 to 5 moist
Chroma—2 to 4, dry or moist
Texture—loam or fine sandy loam
Clay content—15 to 25 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel, channers, or cobbles
Reaction—slightly alkaline to strongly alkaline (pH 7.4 to 9.0)

C horizon:
Hue—7.5YR to 2.5Y
Value—5 to 8 dry; 4 to 6 moist
Chroma—2 to 4, dry or moist
Texture—loam or fine sandy loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel, channers, or cobbles
Reaction—slightly alkaline to strongly alkaline (pH 7.4 to 9.0)

Description of the Gerst Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents
Landform: Shale hills
Geology: Curtis, Summerville, and Entrada Formations (Jurassic)
Parent material: Slope alluvium derived from sandstone and shale over residuum weathered from calcareous shale
Slope: 5 to 8 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 6 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 1.4 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (maximum): About 2 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Clay (Utah Juniper)
Ecological site number: R034XY221UT
Present vegetation (in most areas): Salina wildrye, galleta, shadscale, Indian ricegrass, Brenda's yellow cryptantha, twoneedle pinyon, and Utah juniper
Land capability classification (nonirrigated areas): 7e

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 549119 meters E., 4339711 meters N., zone 12

A—0 to 3 inches (0 to 8 centimeters); pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; 21 percent clay; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, few medium, and few coarse roots; carbonate, finely disseminated; 25 percent gravel,

5 percent cobbles, and 1 percent stones; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; clear wavy boundary.

C1—3 to 11 inches (8 to 28 centimeters); light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; 24 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; common very fine, common fine, few medium, and few coarse roots; carbonate, finely disseminated; 12 percent gravel and 1 percent cobbles; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.4; clear wavy boundary.

C2—11 to 13 inches (28 to 33 centimeters); grayish brown (2.5Y 5/2) channery clay loam, dark grayish brown (2.5Y 4/2) moist; 33 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; common very fine, few fine, few medium, and few coarse roots; carbonate, finely disseminated; 15 percent parachanners and 20 percent channers; strongly effervescent, by HCl, 1 normal; strongly alkaline, pH 8.5; clear irregular boundary.

Cr—13 to 17 inches (33 to 43 centimeters); weakly cemented, weathered shale; few very fine roots in cracks.

Range in Characteristics

A horizon:

Hue—10YR to 5Y
Value—5 to 7 dry; 3 to 6 moist
Chroma—2 to 4, dry or moist
Texture—loam or clay loam
Clay content—15 to 27 percent
Calcium carbonate equivalent—1 to 15 percent
SAR—0 to 2
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—10 to 45 percent gravel, cobbles, or stones
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C horizon:

Hue—10YR to 5Y
Value—5 to 7 dry; 4 to 6 moist
Chroma—1 to 4 dry or moist
Texture—loam, clay loam, or silt loam
Clay content—18 to 30 percent
Calcium carbonate equivalent—1 to 15 percent
Gypsum content—0 to 3 percent
SAR—0 to 2
Electrical conductivity—0 to 8 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

51—Monue-Fruitland complex, 1 to 8 percent slopes

Map Unit Setting

General setting: Lower Cathedral Valley and South Desert
Major land resource area: 35—Colorado Plateau
Elevation: 5,360 to 6,280 feet (1,635 to 1,915 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Monue and similar soils: 55 percent
Fruitland and similar soils: 20 percent
Minor components (25 percent) and their ecological sites:
- Riverwash in channels with no vegetation
- Sheppard soils on stream terraces (very deep, sandy soils); Desert Sand (Fourwing Saltbush)
- Very deep, loamy-skeletal soils on alluvial fans and terraces; Desert Stony Loam (Shadscale-Bud Sagebrush)
- Very deep, fine-loamy soils on high terraces; Desert Loam (Shadscale)
- Oxyaquic Torrifluvents on flood-plain steps of Polk Creek (very deep, sandy-skeletal soils) with alkali muhly, common threesquare, common reed, and tamarisk; Colorado Plateau Complex Discontinuous (Valley Type VIII - B5c Stream Type)

Description of the Monue Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids (fig. 189)
Landform: Stream terraces (fig. 190)
Geology: Alluvial deposits (Holocene)
Parent material: Alluvium derived from sandstone
Slope: 2 to 8 percent, north to south aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 8.3 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Desert Alkali Sandy Loam (Alkali Sacaton)
Ecological site number: R035XY101UT
Present vegetation (in most areas): Alkali sacaton, fourwing saltbush, galleta, greasewood, Indian ricegrass, nodding buckwheat, and rubber rabbitbrush
Land capability classification (nonirrigated areas): 7c
Ground cover (percent):

Plant canopy	25-45
Litter (<5 mm)	5-15
Rock fragments	0-10
Bare soil	40-60
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479636 meters E., 4249890 meters N., zone 12

Figure 189.—Profile of the Monue soil in map unit 51 (Monue-Fruitland complex, 1 to 8 percent slopes). Scale is in centimeters.

A1—0 to 2 inches (0 to 5 centimeters); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; 10 percent clay; moderate thick platy structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; 1 percent gravel and 1 percent channers; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

A2—2 to 6 inches (5 to 15 centimeters); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; 12 percent clay; moderate very thick platy structure; moderately hard, firm, slightly sticky and nonplastic; common fine roots in cracks; common very fine irregular pores; 1 percent gravel and 1 percent channers; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bz1—6 to 28.5 inches (15 to 72 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 14 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; common very fine irregular pores; few fine irregular salt masses in matrix; 1 percent gravel and 1 percent channers; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Figure 190.—The Monue soil in map unit 51 (Monue-Fruitland complex, 1 to 8 percent slopes) on stream terraces in Cathedral Valley.

Bz2—28.5 to 75 inches (72 to 190 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 14 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; common fine irregular salt masses in matrix; 1 percent gravel and 1 percent channers; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Note: Some pedons may have visible secondary carbonate accumulations in Bk horizons

A horizons:

Hue—7.5YR or 5YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—3 to 6 dry; 4 or 6 moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, silt loam, loamy fine sand, or loamy very fine sand
Clay content—5 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Bz horizons:

Hue—7.5YR or 5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 to 6 dry; 4 or 6 moist

Texture—sandy loam, fine sandy loam, very fine sandy loam, or loamy fine sand
Clay content—5 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—4 to 16 mmhos/cm
Rock fragments—0 to 5 percent gravel

Description of the Fruitland Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents
Landform: Stream terraces and alluvial fans (fig. 191)
Geology: Alluvial deposits (Holocene)
Parent material: Alluvium derived from sandstone
Slope: 1 to 5 percent, north to south aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 9.3 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)

Figure 191.—The Fruitland soil in map unit 51 (Monue-Fruitland complex, 1 to 8 percent slopes) on stream terraces and alluvial fans.

Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Alkali Sandy Loam (Alkali Sacaton)
Ecological site number: R035XY101UT
Present vegetation (in most areas): Alkali sacaton, fourwing saltbush, greasewood, Indian ricegrass, rubber rabbitbrush, galleta, and nodding buckwheat
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-45
Litter (<5 mm)	5-15
Rock fragments	0-10
Bare soil	40-60
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 471083 meters E., 4256189 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); brown (7.5YR 5/4) channery fine sandy loam, brown (7.5YR 4/4) moist; 12 percent clay; weak medium platy structure; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 20 percent channers; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

C1—4 to 11.5 inches (10 to 29 centimeters); light brown (7.5YR 6/4) very cobbly fine sandy loam, brown (7.5YR 5/4) moist; 11 percent clay; massive; soft, very friable, slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine irregular pores; 20 percent cobbles, 10 percent stones, and 30 percent channers; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bkb—11.5 to 23.5 inches (29 to 60 centimeters); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; 16 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; many very fine irregular pores; common fine irregular carbonate masses in matrix; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—23.5 to 49 inches (60 to 125 centimeters); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; 11 percent clay; massive; slightly hard, very friable, slightly sticky and nonplastic; few fine roots throughout; many very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—49 to 71 inches (125 to 180 centimeters); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; 8 percent clay; massive; soft, very friable, slightly sticky and nonplastic; few fine roots throughout; many very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of less than 35 percent

A horizon:
Hue—5YR or 7.5YR
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or silt loam

Clay content—8 to 18 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or channers

C1 horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 50 percent gravel or channers

Bk or Bkb horizon (if it occurs):
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers

C2 and C3 horizons:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, or coarse sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers

52—Monue-Myton-Uzona complex, 1 to 15 percent slopes, saline-sodic

Map Unit Setting

General setting: Lower Cathedral Valley
Major land resource area: 35—Colorado Plateau
Elevation: 5,700 to 6,130 feet (1,738 to 1,869 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Monue, saline-sodic and similar soils: 50 percent
Myton, saline-sodic and similar soils: 20 percent
Uzona, saline-sodic and similar soils: 20 percent
Minor components (10 percent):
Riverwash with no vegetation

Figure 192.—Profile of the Monue soil in map unit 52 (Monue-Myton-Uzona complex, 1 to 15 percent slopes, saline-sodic). Scale is in centimeters.

Description of the Monue, Saline-Sodic Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids (fig. 192)
Landform: Stream terraces (fig. 193)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 1 to 8 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 6.9 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None

Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 16 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Desert Alkali Sandy Loam (Alkali Sacaton)
Ecological site number: R035XY101UT
Present vegetation (in most areas): Alkali sacaton, Indian ricegrass, sandhill muhly, annual bursage, fourwing saltbush, greasewood, and sand buckwheat
Land capability classification (nonirrigated areas): 7c
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	5-10
Rock fragments	0-5
Bare soil	50-70
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 476728 meters E., 4261055 meters N., zone 12

Figure 193.—The Monue soil in map unit 52 (Monue-Myton-Uzona complex, 1 to 15 percent slopes, saline-sodic) on stream terraces in Cathedral Valley.

An—0 to 4.5 inches (0 to 11 centimeters); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; 16 percent clay; moderate thick platy structure parting to weak fine subangular blocky; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots throughout; common very fine vesicular pores; violently effervescent; strongly alkaline, pH 8.8; abrupt smooth boundary.

Bw1—4.5 to 12.5 inches (11 to 32 centimeters); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; 14 percent clay; weak very thick platy and weak very coarse prismatic structure; moderately hard, firm, slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; common very fine irregular pores; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw2—12.5 to 33.5 inches (32 to 85 centimeters); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; 14 percent clay; moderate coarse subangular blocky structure; hard, very firm, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.4; gradual smooth boundary.

Cz—33.5 to 71 inches (85 to 180 centimeters); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; 18 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; few fine roots throughout; common very fine irregular pores; few fine irregular salt masses in matrix; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

An horizon:

Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—very fine sandy loam or fine sandy loam
Clay content—10 to 16 percent
Calcium carbonate equivalent—3 to 10 percent
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bw horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 6 moist
Chroma—4 or 6, dry or moist
Texture—very fine sandy loam or fine sandy loam
Clay content—10 to 16 percent
Calcium carbonate equivalent—3 to 10 percent
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Cz horizon:

Hue—5YR or 7.5YR
Clay content—10 to 18 percent
Calcium carbonate equivalent—3 to 10 percent
Gypsum content—0 to 2 percent
SAR—0 to 5
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Figure 194.—Profile of the Myton soil in map unit 52 (Monue-Myton-Uzona complex, 1 to 15 percent slopes, saline-sodic). Scale is in centimeters.

Description of the Myton, Saline-Sodic Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Typic Torriorthents (fig. 194)
Landform: Stream terraces (fig. 195)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 1 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 5.1 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None

Figure 195.—The Myton soil in map unit 52 (Monue-Myton-Uzona complex, 1 to 15 percent slopes, saline-sodic) on stream terraces.

Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Desert Stony Loam (Shadscale-Bud Sagebrush)
Ecological site number: R035XY136UT
Present vegetation (in most areas): Galleta, Indian ricegrass, shadscale, broom snakeweed, mesa dropseed, and phacelia
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	0-5
Rock fragments	5-10
Bare soil	50-65
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 483606 meters E., 4253791 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); reddish brown (5YR 5/4) gravelly sandy loam, reddish brown (5YR 4/4) moist; 14 percent clay; weak medium granular structure; soft, very friable, slightly sticky and nonplastic; few fine and few medium roots throughout; many very fine irregular pores; 25 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C—4 to 14 inches (10 to 36 centimeters); reddish brown (5YR 5/4) very gravelly sandy loam, reddish brown (5YR 4/4) moist; 12 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; 50 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Ckz—14 to 37.5 inches (36 to 95 centimeters); reddish brown (5YR 5/4) very gravelly sandy loam, reddish brown (5YR 4/4) moist; 10 percent clay; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine roots throughout; many very fine irregular pores; common fine irregular salt masses in matrix and few fine irregular carbonate masses in matrix; 40 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Cnz—37.5 to 71 inches (95 to 180 centimeters); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; 14 percent clay; massive; soft, very friable, slightly sticky and nonplastic; few fine roots throughout; many very fine irregular pores; common fine irregular salt masses in matrix; 5 percent gravel; strongly effervescent; strongly alkaline, pH 9.0.

Range in Characteristics

Rock fragments in the particle-size control section: Average of more than 35 percent

A horizon:

Hue—5YR or 7.5YR
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 30 percent gravel

C horizons:

Hue—5YR or 7.5YR
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
SAR—0 to 5
Electrical conductivity—2 to 8 mmhos/cm
Rock fragments—5 to 60 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Uzona, Saline-Sodic Soil

Taxonomic classification: Fine-silty, smectitic, mesic Typic Haplosalids (fig. 196)
Landform: Stream terraces (fig. 197)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone and shale
Slope: 1 to 3 percent, north aspect
Depth to restrictive feature(s): More than 60 inches

Figure 196.—Profile of the Uzona soil in map unit 52 (Monue-Myton-Uzona complex, 1 to 15 percent slopes, saline-sodic). Scale is in centimeters.

Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 6.6 (moderate)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: C
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 35 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Alkali Bottom (Greasewood)
Ecological site number: R035XY003UT

Present vegetation (in most areas): Greasewood, alkali sacaton, Indian ricegrass, rubber rabbitbrush, fourwing saltbush, and Pursh seepweed
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-15
Rock fragments	0-5
Bare soil	30-45
Cyanobacteria crust	2-10
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477069 meters E., 4261184 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; 14 percent clay; moderate thick platy structure; slightly hard, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; common very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

BA—3.5 to 7.5 inches (9 to 19 centimeters); reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; 15 percent clay; weak very thick platy

Figure 197.—The Uzona soil in map unit 52 (Monue-Myton-Uzona complex, 1 to 15 percent slopes, saline-sodic) on stream terraces.

structure; moderately hard, friable, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; slightly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Bn—7.5 to 16 inches (19 to 41 centimeters); reddish brown (5YR 5/4) silty clay loam, reddish brown (5YR 4/4) moist; 31 percent clay; moderate coarse subangular blocky structure; moderately hard, firm, moderately sticky and moderately plastic; common fine, common medium, and common coarse roots throughout; common very fine irregular pores; strongly effervescent; strongly alkaline, pH 8.6; abrupt smooth boundary.

Bz—16 to 31.5 inches (41 to 80 centimeters); reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; 24 percent clay; moderate medium angular blocky structure; moderately hard, firm, moderately sticky and moderately plastic; common fine and common medium roots throughout; common very fine irregular pores; common fine salt masses throughout; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Cnz1—31.5 to 49 inches (80 to 125 centimeters); reddish brown (5YR 5/4) silty clay, reddish brown (5YR 4/4) moist; 41 percent clay; massive; hard, very firm, very sticky and very plastic; common fine roots throughout; common very fine irregular pores; common fine salt masses throughout; strongly effervescent; strongly alkaline, pH 8.8; clear smooth boundary.

Cnz2—49 to 71 inches (125 to 180 centimeters); reddish brown (5YR 5/4) silty clay, reddish brown (5YR 4/4) moist; 45 percent clay; massive; hard, very firm, very sticky and very plastic; common fine roots throughout; common very fine irregular pores; common fine salt masses throughout; slightly effervescent; strongly alkaline, pH 8.8.

Range in Characteristics

A and BA horizons:

Hue—7.5YR or 5YR
Clay content—12 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
SAR—0 to 5
Rock fragments—none
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bn horizon:

Clay content—27 to 35 percent
Calcium carbonate equivalent—10 to 15 percent
SAR—0 to 5
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bz horizon:

Hue—7.5YR or 5YR
Texture—silt loam or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—10 to 15 percent
SAR—0 to 5
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—none
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Cnz horizons:

Clay content—35 to 45 percent
Calcium carbonate equivalent—10 to 15 percent

SAR—10 to 20
Electrical conductivity—16 to 35 mmhos/cm
Rock fragments—none

This Uzona soil is mapped as a taxadjunct to the Uzona series because it has a fine-silty particle-size class. The Uzona series averages more than 35 percent clay in the particle-size control section and has a fine particle-size class.

53—Monue-Sheppard complex, 1 to 6 percent slopes

Map Unit Setting

General setting: South Desert
Major land resource area: 35—Colorado Plateau
Elevation: 5,020 to 5,610 feet (1,530 to 1,710 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Monue and similar soils: 60 percent
Sheppard and similar soils: 25 percent
Minor components (15 percent) and their ecological sites:
Very deep, coarse-loamy soils with calcic horizons on high stream terraces; Desert Alkali Sandy Loam (Alkali Sacaton)

Description of the Monue Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocambids (fig. 198)
Landform: High stream terraces (fig. 199)
Geology: Alluvium and eolian sand (Quaternary)
Parent material: Alluvium derived from sandstone and/or eolian sands derived from sandstone
Slope: 1 to 6 percent, west to south aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 8.7 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Very rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Alkali Sandy Loam (Alkali Sacaton)
Ecological site number: R035XY101UT
Present vegetation (in most areas): Alkali sacaton, Indian ricegrass, sandhill muhly, annual bursage, fourwing saltbush, greasewood, and sand buckwheat
Land capability classification (nonirrigated areas): 7s

Figure 198.—Profile of the Monue soil in map unit 53 (Monue-Sheppard complex, 1 to 6 percent slopes). Scale is in centimeters.

Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	5-10
Rock fragments	0-5
Bare soil	50-70
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 481378 meters E., 4248745 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); light reddish brown (5YR 6/4) fine sandy loam, yellowish red (5YR 4/6) moist; 11 percent clay; weak very thick platy structure;

slightly hard, friable, slightly sticky and slightly plastic; common fine and common medium roots throughout; many very fine irregular pores; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; clear smooth boundary.

Bk—3.5 to 12.5 inches (9 to 32 centimeters); pink (7.5YR 8/4) loam, light brown (7.5YR 6/4) moist; 15 percent clay; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; common very fine irregular pores; common medium irregular carbonate masses in matrix; violently effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bky—12.5 to 45.5 inches (32 to 115 centimeters); pink (5YR 7/4) fine sandy loam, reddish brown (5YR 5/4) moist; 12 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; common very fine and common fine irregular pores; common fine irregular carbonate masses in matrix and few fine irregular gypsum crystals in matrix; strongly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C—45.5 to 75.5 inches (115 to 192 centimeters); loamy sand, strong brown (7.5YR 5/6) moist; 3 percent clay; massive; loose, nonsticky and nonplastic; common very fine irregular, common fine irregular, and common fine interstitial pores; strongly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Note: Some pedons may have a Bw horizon above the Bk horizon; a 2Cy horizon occurs in some pedons that have alluvium derived from sandstone over shale residuum with higher contents of clay and gypsum

Figure 199.—The Monue soil in map unit 53 (Monue-Sheppard complex, 1 to 6 percent slopes) on high stream terraces in Cathedral Valley.

A horizon:
Hue—5YR or 7.5YR
Value—4 or 6, dry or moist
Chroma—4 or 6, dry or moist
Clay content—5 to 15 percent
Calcium carbonate equivalent—1 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 8 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bk horizon:
Hue—5YR or 7.5YR
Value—6 to 8, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or loam
Clay content—10 to 15 percent
Calcium carbonate equivalent—2 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Bky horizon:
Hue—5YR or 7.5YR
Value—6 or 7 dry; 5 or 6 moist
Chroma—4 or 6, dry or moist
Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 3 percent
Gypsum content—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

C horizon:
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, loamy fine sand, loamy sand, fine sand, or sand
Clay content—2 to 8 percent
Calcium carbonate equivalent—1 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 30 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Sheppard Soil

Taxonomic classification: Mixed, mesic Typic Torripsamments (fig. 200)
Landform: Low stream terraces (fig. 201)
Geology: Entrada Sandstone (Jurassic), Quaternary eolian sediments, and Quaternary alluvium sediments
Parent material: Alluvium derived from sandstone and/or eolian sands derived from sandstone
Slope: 1 to 6 percent, southeast to north aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 3.7 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low

Figure 200.—Profile of the Sheppard soil in map unit 53 (Monue-Sheppard complex, 1 to 6 percent slopes). Scale is in centimeters.

Hydrologic group: A
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Alkali Sandy Loam (Alkali Sacaton)
Ecological site number: R035XY101UT
Present vegetation (in most areas): Alkali sacaton, Indian ricegrass, sandhill muhly, annual bursage, fourwing saltbush, greasewood, and sand buckwheat
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	5-10
Rock fragments	0-5
Bare soil	50-70
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0

Figure 201.—Landscape of the Sheppard soil in map unit 53 (Monue-Sheppard complex, 1 to 6 percent slopes). This soil is low on stream terraces.

Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 481746 meters E., 4248365 meters N., zone 12

A—0 to 4.5 inches (0 to 12 centimeters); pink (7.5YR 7/4) loamy sand, brown (7.5YR 5/4) moist; 5 percent clay; weak very thick platy structure; soft, very friable, nonsticky and nonplastic; common fine roots throughout; common very fine and common fine irregular pores; slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear smooth boundary.

C1—4.5 to 31.5 inches (12 to 80 centimeters); pink (5YR 7/4) loamy sand, reddish brown (5YR 5/4) moist; 5 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots throughout; common very fine and common fine irregular pores; very slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear smooth boundary.

C2—31.5 to 53 inches (80 to 135 centimeters); pink (7.5YR 7/4) loamy sand, brown (7.5YR 5/4) moist; 4 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots throughout; common very fine and common fine irregular pores; slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8.

Range in Characteristics

A horizon:

Texture—loamy sand or loamy fine sand
Clay content—1 to 5 percent
Calcium carbonate equivalent—1 to 4
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

C1 horizon:
Hue—5YR or 7.5YR
Texture—loamy sand, loamy coarse sand, fine sand, or sand
Clay content—1 to 5 percent
Calcium carbonate equivalent—1 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

C2 horizon:
Texture—sandy loam, loamy sand, or coarse sand
Clay content—1 to 6 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

54—Mulford silty clay loam, 0 to 5 percent slopes

Map Unit Setting

General setting: Abie Clarke, Cass Mulford, Chesnut, Gifford, and Jorgenson orchards and pastures in the Fruita area (fig. 202)
Major land resource area: 35—Colorado Plateau
Elevation: 5,420 to 5,480 feet (1,652 to 1,669 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)

Figure 202.—Landscape of map unit 54 (Mulford silty clay loam, 0 to 5 percent slopes). This map unit is on stream terraces within the historic orchards at Fruita.

Figure 203.—Profile of the Mulford soil in map unit 54 (Mulford silty clay loam, 0 to 5 percent slopes). Scale is in centimeters.

Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Mulford and similar soils: 90 percent
Minor components (10 percent) and their ecological sites:
- Tineoyler soils on stream terraces (very deep, coarse-loamy soils with weak soil development); Colorado Plateau Riparian Complex Perennial (Valley Type II - B3 Stream Type)
- Very deep, loamy-skeletal soils on stream terraces and flood-plain steps
- Sulphurcreek soils which have an accumulation of clay below the surface horizon on stream terraces

Description of the Mulford Soil

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustifluventic Haplocambids (fig. 203)
Landform: Terraces
Geology: Quaternary alluvium

Parent material: Alluvium derived from basalt and/or alluvium derived from sedimentary rock
Slope: 0 to 5 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 11.4 (very high)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: Rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: C
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - C5/F5 Stream Types)
Ecological site number: R035XY022UT
Present vegetation (in most areas): Orchardgrasses and trees
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	20-25
Rock fragments	0
Bare soil	30-40
Cyanobacteria crust	2-4
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 478064 meters E., 4236995 meters N., zone 12

Ap—0 to 2.5 inches (0 to 6 centimeters); yellowish red (5YR 4/6) silty clay loam, reddish brown (5YR 4/3) moist; 29 percent clay; strong fine subangular blocky structure; moderately hard, friable, slightly sticky and moderately plastic; common fine and many very fine roots throughout; common very fine irregular pores; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; clear smooth boundary.

Bw1—2.5 to 17 inches (6 to 43 centimeters); yellowish red (5YR 5/6) clay loam, reddish brown (5YR 4/4) moist; 28 percent clay; strong medium subangular blocky structure; hard, friable, slightly sticky and moderately plastic; common very fine, common fine, and common medium roots throughout; common medium, common very fine, and common fine irregular pores; 1 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.4; gradual wavy boundary.

Bw2—17 to 27 inches (43 to 68 centimeters); yellowish red (5YR 4/6) clay loam, reddish brown (5YR 4/3) moist; 27 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; common very fine and common medium roots throughout; common very fine irregular pores; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; clear wavy boundary.

B/C—27 to 38 inches (68 to 96 centimeters); yellowish red (5YR 4/6) gravelly loam, reddish brown (5YR 4/4) moist; 25 percent clay; massive; slightly hard, friable, slightly sticky and moderately plastic; common very fine, common fine, and common medium roots throughout; common very fine irregular pores; 18 percent gravel and 12 percent cobbles; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; gradual smooth boundary.

C—38 to 62.5 inches (96 to 159 centimeters); reddish brown (5YR 5/4) gravelly loam, reddish brown (5YR 4/4) moist; 22 percent clay; massive; slightly hard, friable, slightly sticky and moderately plastic; common very fine irregular pores; 22 percent gravel and 3 percent cobbles; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0.

Range in Characteristics

Note: Some pedons exhibit redox features below a depth of 100 centimeters as the result of a fluctuating water table

Ap horizon:

Value—3 or 4, dry or moist
Chroma—2 to 6 dry; 1 to 4 moist
Texture—loam, sandy clay loam, silt loam, silty clay loam, or clay loam
Clay content—20 to 30 percent
Calcium carbonate equivalent—0 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw horizon:

Hue—2.5YR or 5YR
Value—4 or 5, dry or moist
Chroma—4 or 6 dry; 3 to 6 moist
Texture—loam, sandy clay loam, silt loam, or clay loam
Clay content—20 to 30 percent
Calcium carbonate equivalent—0 to 15 percent
Gypsum content—0 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 20 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

BC horizon (if it occurs):

Value—4 or 5, dry or moist
Chroma—3 to 6, dry or moist
Clay content—20 to 25 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 30 percent gravel and cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon:

Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—loamy fine sand, very fine sandy loam, silt loam, loam, silty clay loam, or silty clay
Clay content—10 to 40 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm

Figure 204.—Landscape of map unit 55 (Mussentuchit-Goblin-Swell family association, 3 to 20 percent slopes). This map unit is on hills.

Rock fragments—0 to 30 percent gravel and cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

55—Mussentuchit-Goblin-Swell family association, 3 to 20 percent slopes

Map Unit Setting

General setting: Cathedral Valley and the area along the northern boundary of the park where Emery County joins Capitol Reef National Park (fig. 204)
Major land resource area: 35—Colorado Plateau
Elevation: 4,300 to 6,200 feet (1,311 to 1,890 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 48 to 53 degrees F (8.9 to 11.7 degrees C)
Mean annual soil temperature: 50 to 55 degrees F (10.0 to 12.8 degrees C)
Frost-free period: 130 to 160 days

Map Unit Composition

Note: The components of this map unit could have been separated at a scale of 1:24,000 scale, but because use and management are dictated by the shallow gypsum occurring in all three components, there was no advantage in doing so.

Mussentuchit and similar soils: 45 percent
Goblin and similar soils: 25 percent
Swell family and similar soils: 20 percent

Minor components (10 percent):
- Gypsum land on barren hills and escarpments
- Shallow gravelly soils over sandstone bedrock on structural benches under shadscale and grass
- Shallow loamy soils on shale hills under shadscale
- Rock outcrop of shale and siltstone as cliffs, ledges, escarpments, and erosional remnants

Description of the Mussentuchit Soil

Taxonomic classification: Coarse-loamy, gypsic, mesic Leptic Haplogypsids (fig. 205)
Landform: Gypsum hills
Geology: Entrada Sandstone (Jurassic)
Parent material: Eolian deposits and/or slope alluvium over gypsiferous residuum weathered from sandstone and shale
Slope: 5 to 20 percent, west to southeast aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 3.0 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: B
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 3 SAR (slightly sodic)
Ecological site name: Desert Gypsum Loam (Torrey's Jointfir)
Ecological site number: R035XY106UT
Present vegetation (in most areas): Bigelow sagebrush, galleta, Torrey Mormon tea, broom snakeweed, buckwheat, and green rabbitbrush (fig. 206)
Land capability classification (nonirrigated areas): 7e

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 476626 meters E., 4261994 meters N., zone 12

A—0 to 4.5 inches (0 to 11 centimeters); yellowish red (5YR 5/6) crushed very fine sandy loam, yellowish red (5YR 4/6) crushed and moist; 13 percent clay; weak medium granular structure; soft, friable, nonsticky and nonplastic; few very fine roots throughout; fine tubular pores; common fine irregular gypsum masses in matrix; 1 percent gravel and 5 percent cobbles; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt smooth boundary.

By1—4.5 to 12 inches (11 to 31 centimeters); reddish brown (5YR 5/4) crushed fine sandy loam, yellowish red (5YR 4/6) crushed and moist; 16 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; fine tubular pores; common fine irregular gypsum masses in matrix and common fine irregular gypsum crystals in matrix; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; gradual smooth boundary.

By2—12 to 27.5 inches (31 to 70 centimeters); reddish brown (5YR 4/4) crushed fine sandy loam, yellowish red (5YR 4/6) crushed and moist; 17 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and

Figure 205.—Profile of the Mussentuchit soil in map unit 55 (Mussentuchit-Goblin-Swell family association, 3 to 20 percent slopes). Scale is in centimeters.

nonplastic; few fine and common medium roots throughout; fine tubular pores; common medium irregular gypsum crystals in matrix; 5 percent channers; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; abrupt smooth boundary.

Cr—27.5 to 39.5 inches (70 to 100 centimeters); weakly cemented gypsiferous shale and siltstone.

R—39.5 to 49 inches (100 to 125 centimeters); strongly cemented gypsiferous shale and siltstone.

Figure 206.—Typical surface of the Mussentuchit soil in map unit 55 (Mussentuchit-Goblin-Swell family association, 3 to 20 percent slopes).

Range in Characteristics

A horizon:

Value—5 or 6 dry
Texture—silt loam or very fine sandy loam
Clay content—5 to 15 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—1 to 5 percent
Electrical conductivity—2 to 4 mmhos/cm
SAR—1 to 3
Rock fragments—0 to 20 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw horizon (if it occurs):

Value—5 or 7 dry
Chroma—4 or 6 dry
Texture—fine sandy loam or sandy loam
Clay content—5 to 17 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—3 to 10 percent
Electrical conductivity—0 to 4 mmhos/cm
SAR—0 to 1
Rock fragments—0 to 10 percent
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

By and Cy horizons:

Hue—5YR or 7.5YR

Value—4 to 8, dry or moist
Chroma—4 or 6 moist
Texture—fine sandy loam or loamy fine sand
Clay content—2 to 17 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—15 to 30 percent
Electrical conductivity—0 to 4 mmhos/cm
SAR—0 to 1
Rock fragments—0 to 10 percent parachanners
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Mussentuchit soil is a taxadjunct of the Mussentuchit series because it has 15 to 40 percent gypsum in the particle-size control section whereas the Mussentuchit series contains more than 40 percent gypsum.

Description of the Goblin Soil

Taxonomic classification: Loamy, gypsic, mesic, shallow Leptic Haplogypsids (fig. 207)
Landform: Dissected hills and structural benches
Geology: Entrada Sandstone (Jurassic)
Parent material: Slope alluvium over residuum weathered from gypsiferous shale and sandstone
Slope: 5 to 20 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 5 to 20 inches
Drainage class: Well drained

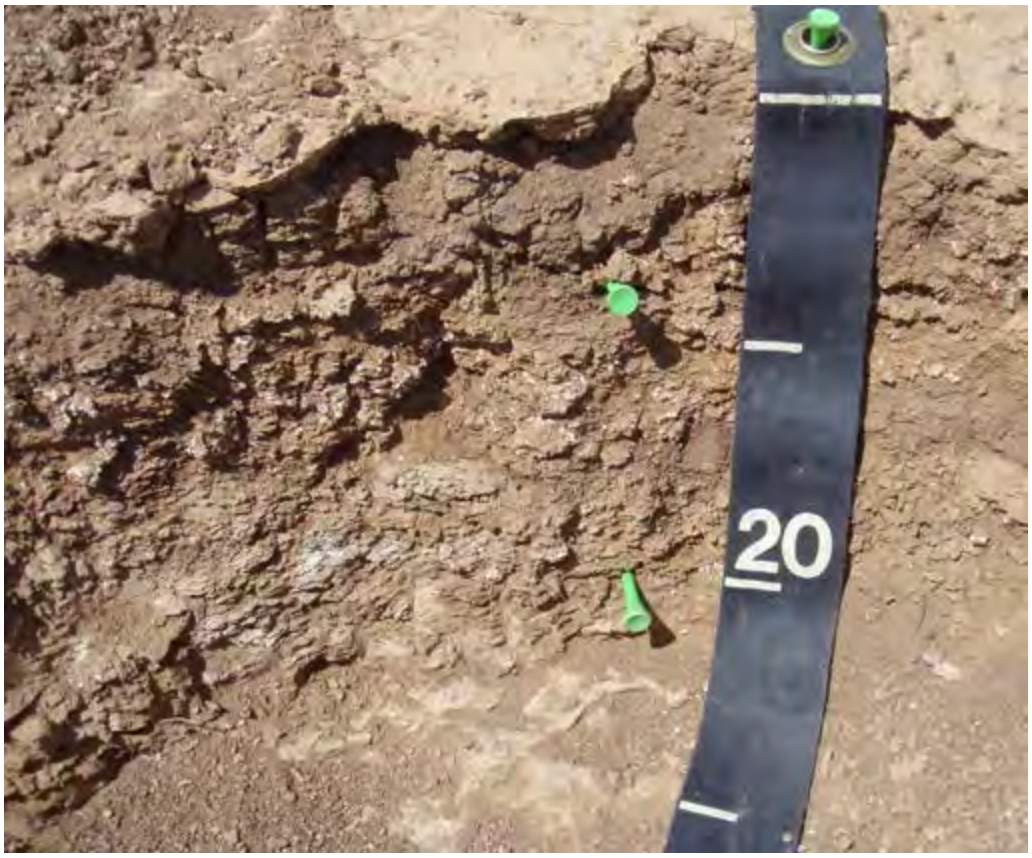

Figure 207.—Profile of the Goblin soil in map unit 55 (Mussentuchit-Goblin-Swell family association, 3 to 20 percent slopes). Gypsum bedrock is at a depth of 20 centimeters. Scale is in centimeters.

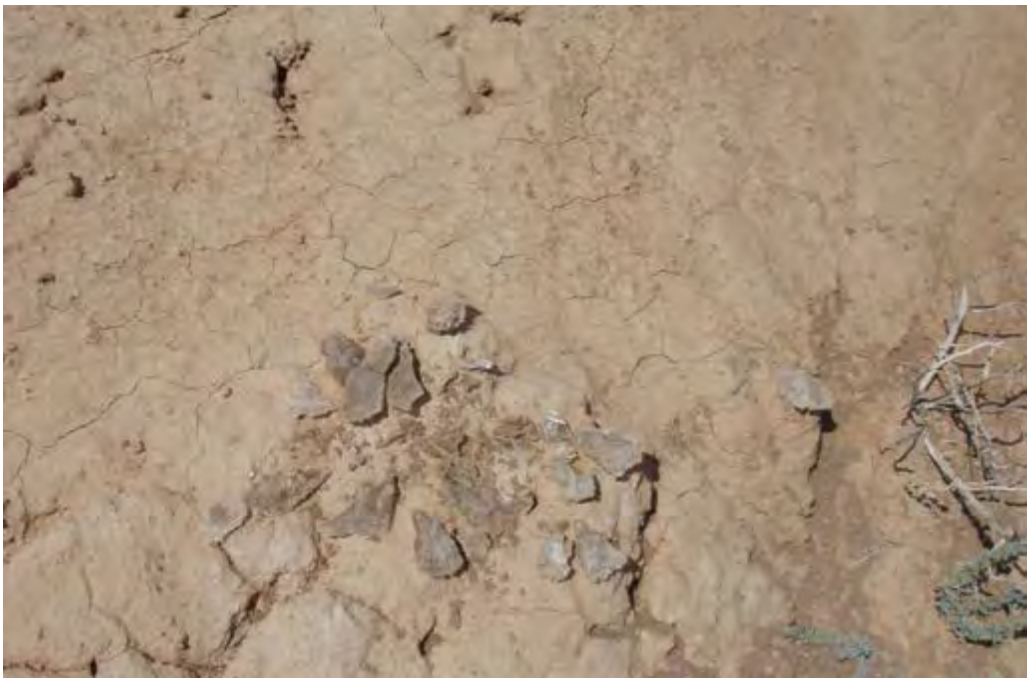

Figure 208.—Typical surface of the Goblin soil in map unit 55 (Mussentuchit-Goblin-Swell family association, 3 to 20 percent slopes). Gypsum coats the underside of the surface crust.

Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 25 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Desert Very Shallow Gypsum (Torrey's Jointfir)
Ecological site number: R035XY142UT
Present vegetation (in most areas): Castle Valley saltbush, saltlover, and Torrey's jointfir (fig. 208)
Land capability classification (nonirrigated areas): 7e

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 476540 meters E., 4262076 meters N., zone 12

A—-0 to 3 inches (0 to 7 centimeters); reddish brown (5YR 4/3) gypsiferous loam, dark reddish brown (5YR 3/4) moist; 17 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots throughout; many very fine irregular pores; 5 percent gravel and 5 percent parachanners; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt smooth boundary.

By—3 to 8 inches (7 to 20 centimeters); reddish brown (5YR 4/3) parachannery gypsiferous loam, dark reddish brown (5YR 3/4) moist; 17 percent clay; massive;

slightly hard, firm, nonsticky and nonplastic; few very fine, few fine, and few medium roots throughout; many very fine irregular pores; many coarse irregular gypsum masses in matrix; 25 percent parachanners and 25 percent channers; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.4; abrupt smooth boundary.

Cr—8 to 11 inches (20 to 28 centimeters); weakly cemented gypsiferous shale and siltstone.

R—11 to 21 inches (28 to 53 centimeters); strongly cemented gypsiferous shale and siltstone.

Range in Characteristics

A horizon:

Hue—5YR or 7.5YR
Value—3 to 5, dry or moist
Texture—loam, silt loam, or fine sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—15 to 20 percent
Gypsum content—15 to 20 percent
SAR—0 to 3
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 10 percent
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

By horizon:

Hue—5YR or 7.5YR
Value—3 to 5, dry or moist
Chroma—3 to 6, dry or moist
Texture—loam, silt loam, or fine sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—15 to 25 percent
Gypsum content—20 to 30 percent
SAR—1 to 5
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—15 to 50 percent paragravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

The Goblin soil in this map unit differs from the Goblin series in that it has color value of 4 dry and 3 moist and electrical conductivity as high as 4 mmhos/cm. The Goblin series has value of more than 5 dry or moist and electrical conductivity of 2 or less. In general, the Goblin soil in this map unit has a lower content of calcium carbonate content than is typical of the Goblin series.

Description of the Swell Family Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau whereas the Swell series occurs in MLRA 34B—Warm Central Desertic Basins and Plateaus.

Taxonomic classification: Coarse-loamy, mixed, active, mesic Typic Calcigypsids
Landform: Hills
Geology: Entrada Sandstone (Jurassic)
Parent material: Gypsiferous slope alluvium derived from sandstone and shale and gypsiferous slope alluvium over residuum weathered from sandstone and shale
Slope: 3 to 12 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 40 to 80 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity (total inches): About 10.2 (very high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 25 percent
Salinity maximum: About 12 mmhos/cm (moderately saline)
Sodium adsorption ratio (maximum): About 13 SAR (moderately sodic)
Ecological site name: Desert Gypsum Loam (Torrey's Jointfir)
Ecological site number: R035XY106UT
Present vegetation (in most areas): Buckwheat, Indian ricegrass, Torrey's jointfir, and Bigelow sage
Land capability classification (nonirrigated areas): 7e

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 494170 meters E., 4306032 meters N., zone 12

A—0 to 3 inches (0 to 8 centimeters); light brown (7.5YR 6/4) very fine sandy loam, strong brown (7.5YR 4/6) moist; 15 percent clay; moderate medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, few fine, few medium, and few coarse roots; 5 percent gravel; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bw—3 to 8 inches (8 to 20 centimeters); reddish yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 4/6) moist; 14 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, few fine, few medium, and few coarse roots; 2 percent gravel; very slightly effervescent; moderately alkaline, pH 7.9; clear wavy boundary.

Bky1—8 to 27 inches (20 to 69 centimeters); light brown (7.5YR 6/4) fine sandy loam, strong brown (7.5YR 5/6) moist; 12 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, few fine, few medium, and few coarse roots; 2 percent gravel; strongly effervescent; moderately alkaline, pH 7.9; clear wavy boundary.

Bky2—27 to 65 inches (69 to 165 centimeters); strong brown (7.5YR 4/6) fine sandy loam, strong brown (7.5YR 5/6) moist; 10 percent clay; single grain; loose, slightly sticky and slightly plastic; few fine and few very fine roots; 5 percent gravel; strongly effervescent; moderately alkaline, pH 7.9; clear wavy boundary.

BCy—65 to 86 inches (165 to 218 centimeters); light brown (7.5YR 6/4) fine sandy loam, strong brown (7.5YR 4/6) moist; 19 percent clay; massive; slightly hard, very friable, slightly sticky and slightly plastic; 2 percent gravel; very slightly effervescent; moderately alkaline, pH 8.1.

Range in Characteristics

A horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry
Chroma—4 or 6 moist
Texture—fine sandy loam or loamy very fine sand
Clay content—2 to 12 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—0 to 1 percent
Electrical conductivity—0 to 4 mmhos/cm

Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry
Chroma—4 or 6, dry or moist
Texture—very fine sandy loam or fine sandy loam
Clay content—6 to 15 percent
Calcium carbonate equivalent—5 to 14 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 10 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bky and BCy horizons:
Hue—5YR or 7.5YR
Value—4 to 6, dry or moist
Chroma—4 or 6 moist
Texture—very fine sandy loam or fine sandy loam
Clay content—8 to 20 percent
Calcium carbonate equivalent—15 to 25 percent
Gypsum content—10 to 35 percent
Electrical conductivity—0 to 12 mmhos/cm
SAR—0 to 13
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

56—Nepalto very gravelly sandy loam, 5 to 18 percent slopes, very bouldery

Map Unit Setting

General setting: Sites adjacent to Glen Canyon National Recreation Area along Halls Creek
Major land resource area: 35—Colorado Plateau
Elevation: 3,150 to 4,040 feet (960 to 1,231 meters)
Mean annual precipitation: 6 to 10 inches (150 to 250 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days

Map Unit Composition

Nepalto and similar soils: 95 percent
Minor components (5 percent):
Shallow, loamy soils on hills and structural benches (desert, mesic)
Soils on slopes greater than 18 percent (desert, mesic)
Soils with textures finer than loam (desert, mesic)

Description of the Nepalto Soil

Note: This soil is assigned a very bouldery phase because stones and boulders cover 2 to 5 percent of the soil surface.

Taxonomic classification: Sandy-skeletal, mixed, mesic Typic Torriorthents
Landform: Base slopes on fan remnants

Geology: Terrace gravel deposits (Quaternary)
Parent material: Colluvium and/or slope alluvium derived from sandstone and shale
Slope: 5 to 18 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 3.5 (low)
Shrink-swell potential: About 1.0 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Desert Stony Loam (Shadscale-Bud Sagebrush)
Ecological site number: R035XY136UT
Present vegetation (in most areas): Shadscale saltbush, galleta, fluffgrass, and gooseberryleaf globemallow
Land capability classification (nonirrigated areas): 7c
Ground cover (percent):

Plant canopy	13
Litter (<5 mm)	13
Rock fragments	64
Bare soil	17
Cyanobacteria crust	4
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 443842 meters E., 4078300 meters N., zone 12

C1—0 to 2 inches (0 to 5 centimeters); reddish brown (5YR 5/4) very gravelly sandy loam, reddish brown (5YR 4/4) moist; 12 percent clay; massive; loose, nonsticky and nonplastic; common fine and common very fine roots throughout; common very fine dendritic tubular pores; 35 percent gravel and 5 percent cobbles; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; clear wavy boundary.

C2—2 to 7 inches (5 to 18 centimeters); reddish brown (5YR 5/4) gravelly sandy loam, reddish brown (5YR 4/4) moist; 10 percent clay; massive; soft, very friable, nonsticky and nonplastic; common fine and many very fine roots throughout; 20 percent gravel; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; clear wavy boundary.

C3—7 to 30 inches (18 to 76 centimeters); reddish brown (5YR 5/4) extremely gravelly loamy sand, reddish brown (5YR 4/4) moist; 8 percent clay; massive; moderately hard, friable, nonsticky and nonplastic; 50 percent gravel, 15 percent cobbles, and 5 percent stones; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear wavy boundary.

C4—30 to 47 inches (76 to 119 centimeters); reddish brown (5YR 5/4) very gravelly loamy coarse sand, reddish brown (5YR 4/4) moist; 7 percent clay; massive; hard, friable, nonsticky and nonplastic; 30 percent gravel, 5 percent cobbles, and 5

percent stones; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; gradual wavy boundary.

C5—47 to 60 inches (119 to 152 centimeters); reddish brown (5YR 5/4) very gravelly loam, reddish brown (5YR 4/4) moist; 16 percent clay; massive; slightly hard, very friable, slightly sticky and slightly plastic; 35 percent gravel and 5 percent cobbles; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; clear wavy boundary.

C6—60 to 64 inches (152 to 163 centimeters); reddish brown (5YR 5/4) very stony sandy loam, reddish brown (5YR 4/4) moist; 12 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; 25 percent gravel, 5 percent cobbles, and 15 percent stones; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0.

Range in Characteristics

Reaction: pH 7.4 to 8.4 (slightly alkaline or moderately alkaline)

C horizons:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 to 6 moist
Chroma—4 to 6, dry or moist
Texture—sandy loam, loamy sand, loamy coarse sand, or loam; averaging sand or loamy sand in the particle-size control section
Clay content—4 to 18 percent
Rock fragments—20 to 75 percent; averaging more than 35 percent

This Nepalto soil differs from the Nepalto series in that it has slopes up to 18 percent whereas the Nepalto series has slopes of less than 8 percent.

57—Nizhoni-Rock outcrop complex, 2 to 35 percent slopes

Map Unit Setting

General setting: Areas south of Paradise Flats
Major land resource area: 35—Colorado Plateau
Elevation: 6,390 to 7,890 feet (1,947 to 2,405 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 44 to 46 degrees F (6.7 to 7.8 degrees C)
Mean annual soil temperature: 46 to 48 degrees F (7.8 to 8.9 degrees C)
Frost-free period: 120 to 140 days

Map Unit Composition

Nizhoni and similar soils: 60 percent
Rock outcrop, Kayenta and Navajo Formations sandstone: 20 percent
Minor components (20 percent) and their ecological sites:

Parkwash soils on coppice mounds and sand sheets on structural benches (shallow, sandy soils); Upland Shallow Sand (Pinyon-Utah Juniper)
Foy soils on escarpments, side slopes, and pediment remnants (deep and very deep, loamy-skeletal soils with calcic horizons); Upland Stony Loam (Pinyon-Utah Juniper)
Mathis, cool soils on escarpments and talus slopes (deep and very deep, sandy-skeletal soils); Upland Stony Sand (Utah Juniper-Pinyon)
Riverwash in channels with no vegetation

Description of the Nizhoni Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, frigid Aridic Lithic Ustorthents
Landform: Structural benches
Geology: Kayenta Formation (Jurassic)
Parent material: Residuum weathered from sandstone and/or slope alluvium derived from sandstone
Slope: 2 to 35 percent, west to southeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.0 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Shallow Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY315UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, alderleaf mountain mahogany, Salina wildrye, Utah serviceberry, Indian ricegrass, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	10-20
Rock fragments	30-40
Bare soil	15-25
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 470225 meters E., 4250512 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); reddish brown (2.5YR 4/4) fine sandy loam, dark red (2.5YR 3/6) moist; 14 percent clay; weak fine angular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine irregular pores; 7 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C—2 to 8 inches (5 to 20 centimeters); reddish brown (2.5YR 4/4) gravelly fine sandy loam, dark red (2.5YR 3/6) moist; 15 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine, common fine, common medium, and common coarse roots throughout; many very fine irregular pores; 15 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; very abrupt smooth boundary.

R—8 to 17.5 inches (20 to 45 centimeters); indurated, unfractured sandstone.

Range in Characteristics

A horizon:
Hue—5YR or 2.5YR
Value—4 to 6 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—loamy fine sand or fine sandy loam
Clay content—5 to 15 percent
Calcium carbonate equivalent—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon:
Hue—5YR or 2.5YR
Value—4 to 6 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Clay content—8 to 16 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 20 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Nizhoni soil is considered a taxadjunct to the Nizhoni series because it is in a frigid soil temperature regime whereas the Nizhoni series is mesic.

Description of the Rock Outcrop, Kayenta and Navajo Formations Sandstone

This component is characterized by nearly level to strongly sloping rock outcrop with discontinuous cliffs and escarpments. The lithology is sandstone. The vertical relief is typically a few feet, and the continuity of the cliffs is broken. Typically, there are enough cliffs to impede vehicular travel to some degree. The area can be negotiated by full-sized four-wheeled vehicles with difficulty. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

58—Nizhoni-Rock outcrop complex, 20 to 50 percent slopes

Map Unit Setting

General setting: Top of the Waterpocket Fold (fig. 209)
Major land resource area: 35—Colorado Plateau
Elevation: 5,300 to 7,660 feet (1,614 to 2,334 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 45 to 47 degrees F (7.2 to 8.3 degrees C)
Mean annual soil temperature: 47 to 49 degrees F (8.3 to 9.4 degrees C)
Frost-free period: 125 to 145 days

Map Unit Composition

Nizhoni and similar soils: 60 percent
Rock outcrop, Kayenta Formation sandstone: 30 percent
Minor components (10 percent) and their ecological sites:
Metuck soils on plateaus (shallow, loamy-skeletal soils); Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)

Figure 209.—Landscape of map unit 58 (Nizhoni-Rock outcrop complex, 20 to 50 percent slopes).

Description of the Nizhoni Soil

Taxonomic classification: Loamy, mixed, active, calcareous, mesic Aridic Lithic Ustorthents (fig. 210)
Landform: Structural benches
Geology: Kayenta Formation (Jurassic)
Parent material: Residuum weathered from sandstone
Slope: 20 to 50 percent, north to southwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 2 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 0.3 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Shallow Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY315UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, alderleaf mountain mahogany, Salina wildrye, Utah serviceberry, Indian ricegrass, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7s

Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	10-20
Rock fragments	30-40
Bare soil	15-25
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 491037 meters E., 4204952 meters N., zone 12

C—0 to 2.5 inches (0 to 6 centimeters); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; 11 percent clay; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; many very fine irregular pores; 10 percent gravel; slightly effervescent; slightly alkaline, pH 7.8; very abrupt wavy boundary.

R—2.5 to 12 inches (6 to 31 centimeters); indurated, unfractured sandstone; common fine roots at top of horizon.

Range in Characteristics

C horizon:

Hue—2.5YR to 10YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist

Figure 210.—Profile of the Nizhoni soil in map unit 58 (Nizhoni-Rock outcrop complex, 20 to 50 percent slopes).

Texture—fine sandy loam, sandy clay loam, or loam
Clay content—10 to 22 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Rock Outcrop, Kayenta Formation Sandstone

This component is characterized by nearly level to strongly sloping rock outcrop with discontinuous cliffs and escarpments. The lithology is sandstone. The vertical relief commonly ranges from a few feet to several feet, and the continuity of cliffs is broken. Typically, there are enough cliffs to make travel by full-sized four-wheeled vehicles very difficult. The impediment to foot travel or to animals is usually only slight to moderate. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

59—Nizhoni-Rock outcrop-Pinepoint complex, 2 to 20 percent slopes

Map Unit Setting

General setting: West side of Meeks Mesa
Major land resource area: 35—Colorado Plateau
Elevation: 6,570 to 7,600 feet (2,003 to 2,318 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 45 to 47 degrees F (7.2 to 8.3 degrees C)
Mean annual soil temperature: 47 to 49 degrees F (8.3 to 9.4 degrees C)
Frost-free period: 125 to 145 days

Map Unit Composition

Nizhoni and similar soils: 40 percent
Rock outcrop, Kayenta and Wingate Formations sandstone: 35 percent
Pinepoint, dry and similar soils: 20 percent
Minor components (5 percent) and their ecological sites:
Nizhoni, steep soils on escarpments between structural benches (shallow, loamy soils); Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)

Description of the Nizhoni Soil

Taxonomic classification: Loamy, mixed, active, calcareous, mesic Aridic Lithic Ustorthents (fig. 211)
Landform: Structural benches and mesas (fig. 212)
Geology: Kayenta Formation (Jurassic)
Parent material: Eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.5 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high

Figure 211.—Profile of the Nizhoni soil in map unit 59 (Nizhoni-Rock outcrop-Pinepoint complex, 2 to 20 percent slopes). Scale is in centimeters.

Hydrologic group: D
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Shallow Loam (Pinyon-Utah Juniper)
Ecological site number: R035XY315UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, Indian ricegrass, blue grama, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	0-5
Rock fragments	15-25
Bare soil	40-50
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 469708 meters E., 4244230 meters N., zone 12

Figure 212.—Landscape of the Nizhoni soil in map unit 59 (Nizhoni-Rock outcrop-Pinepoint complex, 2 to 20 percent slopes). This soil is on structural benches and mesas.

A—0 to 3 inches (0 to 8 centimeters); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; 4 percent clay; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots throughout; many very fine irregular pores; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

C1—3 to 10 inches (8 to 25 centimeters); red (2.5YR 5/6) loamy fine sand, dark reddish brown (5YR 3/4) moist; 6 percent clay; weak medium and weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; noneffervescent; slightly alkaline, pH 7.8; clear wavy boundary.

C2—10 to 14.5 inches (25 to 37 centimeters); reddish brown (2.5YR 4/4) fine sandy loam, reddish brown (2.5YR 4/4) moist; 8 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

R—14.5 to 24.5 inches (37 to 62 centimeters); indurated, unfractured sandstone; common medium and common coarse roots at top of horizon.

Range in Characteristics

A horizon:

Hue—5YR or 2.5YR
Value—5 or 6 dry; 4 or 5 moist
Texture—loamy fine sand or fine sandy loam
Clay content—4 to 8 percent
Calcium carbonate equivalent—0 to 1 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel or channers

C horizons:
Hue—5YR or 2.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—loamy fine sand or fine sandy loam
Clay content—4 to 8 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel or channers
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Rock Outcrop, Kayenta and Wingate Formations Sandstone

This component is characterized by nearly level to strongly sloping rock outcrop with many cliffs and escarpments. The lithology is sandstone. The vertical relief ranges from a few feet to several tens of feet, and the continuity of cliffs is broken. Typically, the vertical relief and continuity of cliffs make travel by full-sized four-wheeled vehicles nearly impossible. Travel by foot is difficult and strenuous. This component is usually a natural barrier to livestock and many other terrestrial animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

Description of the Pinepoint, Dry Soil

Note: A dry phase is assigned to this soil to account for the pinyon and juniper vegetation.

Taxonomic classification: Mesic, coated Ustic Quartzipsamments (fig. 213)
Landform: Dunes on mesas and dunes on structural benches (fig. 214)
Geology: Eolian deposits (Holocene and Upper Pleistocene)
Parent material: Eolian sands derived from sandstone
Slope: 2 to 20 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 40 to 80 inches
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 4.9 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Sand (Utah Juniper-Pinyon)
Ecological site number: R035XY324UT
Present vegetation (in most areas): Twoneedle pinyon, needle and thread, blue grama, Utah juniper, sandhill muhly, brittle pricklypear, and fourwing saltbush
Land capability classification (nonirrigated areas): 6s
Ground cover (percent):

Plant canopy	30-45
Litter (<5 mm)	10-20
Rock fragments	0-10
Bare soil	25-35
Cyanobacteria crust	0-10
Lichen crust	0

Figure 213.—Profile of the Pinepoint soil in map unit 59 (Nizhoni-Rock outcrop-Pinepoint complex, 2 to 20 percent slopes). Scale is in centimeters.

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 469467 meters E., 4243949 meters N., zone 12

C1—0 to 4 inches (0 to 10 centimeters); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; 4 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots throughout; many very fine irregular pores; noneffervescent; slightly alkaline, pH 7.6; clear smooth boundary.

C2—4 to 16.5 inches (10 to 42 centimeters); yellowish red (5YR 5/8) loamy fine sand, yellowish red (5YR 4/6) moist; 5 percent clay; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine irregular pores; noneffervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C3—16.5 to 47 inches (42 to 120 centimeters); yellowish red (5YR 5/8) fine sand, red (2.5YR 4/8) moist; 4 percent clay; massive; moderately hard, firm, nonsticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C4—47 to 65 inches (120 to 165 centimeters); reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 4/6) moist; 5 percent clay; massive; moderately hard, firm, nonsticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

R—65 to 75 inches (165 to 190 centimeters); indurated, unfractured sandstone.

Range in Characteristics

A horizon or surface C horizon:

Value—5 or 6 dry
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—3 to 6 percent
Calcium carbonate equivalent—0 to 1 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

C horizons:

Hue—5YR or 2.5YR
Value—5 or 6 dry

Figure 214.—The Pinepoint soil in map unit 59 (Nizhoni-Rock outcrop-Pinepoint complex, 2 to 20 percent slopes) on dunes on structural benches.

Chroma—6 or 8, dry or moist
Texture—fine sand or loamy fine sand
Clay content—2 to 6 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

60—Notom-Begay, moist-Bowington complex, 1 to 6 percent slopes

Map Unit Setting

General setting: Areas by upper parts of Oak and Pleasant Creeks
Major land resource area: 35—Colorado Plateau
Elevation: 5,790 to 6,250 feet (1,764 to 1,905 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Notom and similar soils: 40 percent
Begay, moist and similar soils: 20 percent
Bowington and similar soils: 10 percent
Minor components (30 percent) and their ecological sites:
Riverwash in channels with no vegetation
Water
Kwakina soils on flood-plain steps (very deep, sandy soils); Colorado Plateau Riparian Complex Perennial (Valley Type VIII - B4c Stream Type) with Fremont cottonwood, basin big sagebrush, fourwing saltbush, Indian ricegrass, and rubber rabbitbrush

Description of the Notom Soil

Taxonomic classification: Sandy-skeletal, mixed, mesic Ustic Torrifluvents (fig. 215)
Landform: Flood-plain steps (fig. 216)
Geology: Quaternary alluvium
Parent material: Mixed alluvium derived from igneous and sedimentary rock
Slope: 1 to 6 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: More than 20 in/hr (very rapid)
Available water capacity (total inches): About 2.6 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type VIII - B4c Stream Type)

Figure 215.—Profile of the Notom soil in map unit 60 (Notom-Begay, moist-Bowington complex, 1 to 6 percent slopes). Scale is in centimeters.

Ecological site number: R035XY021UT
Present vegetation (in most areas): Fremont cottonwood, basin big sagebrush, Indian ricegrass, rubber rabbitbrush, and alkali sacaton
Land capability classification (nonirrigated areas): 7c
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	35-45
Cyanobacteria crust	2-6
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 216.—The Notom soil in map unit 60 (Notom-Begay, moist-Bowington complex, 1 to 6 percent slopes) on flood-plain steps.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 483824 meters E., 4225703 meters N., zone 12

C1—0 to 8 inches (0 to 20 centimeters); reddish brown (5YR 5/4) fine sand, reddish brown (5YR 4/4) moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C2—8 to 22.5 inches (20 to 57 centimeters); brown (7.5YR 5/4) extremely gravelly sand, reddish brown (5YR 4/4) moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common very fine, common fine, common medium, and common coarse roots throughout; many very fine interstitial pores; 60 percent gravel, 10 percent cobbles, and 5 percent stones; very slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C3—22.5 to 78.5 inches (57 to 200 centimeters); yellowish red (5YR 5/6) extremely gravelly fine sand, reddish brown (5YR 4/4) moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common fine roots throughout; many very fine interstitial pores; 60 percent gravel, 10 percent cobbles, and 2 percent stones; very slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

C horizons:
Hue—5YR or 7.5YR
Chroma—4 or 6, dry or moist
Texture—sand or fine sand
Clay content—3 to 8 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 75 percent gravel, cobbles, and stones

Description of the Begay, Moist Soil

Note: A moist phase is assigned to this soil to account for the sagebrush vegetation. In other map units, this phase refers to a Wyoming big sagebrush community. This component receives additional moisture from adjacent slopes and supports a plant community characterized by basin big sagebrush.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 217)
Landform: Stream terraces (fig. 218)
Geology: Quaternary alluvium
Parent material: Mixed alluvium derived from igneous and sedimentary rock
Slope: 1 to 5 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 10.7 (very high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Loamy Bottom (Basin Big Sagebrush)
Ecological site number: R035XY011UT
Present vegetation (in most areas): Basin big sagebrush, Indian ricegrass, needle and thread, rubber rabbitbrush, and skunkbush sumac
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	20-25
Rock fragments	0-5
Bare soil	35-45
Cyanobacteria crust	0-2
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 483457 meters E., 4225592 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); yellowish red (5YR 4/6) fine sandy loam, dark reddish brown (5YR 3/4) moist; 13 percent clay; weak very coarse prismatic

Figure 217.—Profile of the Begay, moist soil in map unit 60 (Notom-Begay, moist-Bowington complex, 1 to 6 percent slopes). Scale is in centimeters.

structure parting to weak coarse subangular blocky; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

Bw1—4 to 12 inches (10 to 31 centimeters); yellowish red (5YR 4/6) fine sandy loam, dark reddish brown (5YR 3/4) moist; 16 percent clay; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and nonplastic; few very fine, few fine, and few medium roots throughout; common very fine irregular pores; 1 percent gravel; slightly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw2—12 to 29.5 inches (31 to 75 centimeters); yellowish red (5YR 4/6) fine sandy loam, dark reddish brown (5YR 3/4) moist; 15 percent clay; moderate very coarse

angular blocky structure; moderately hard, firm, slightly sticky and nonplastic; few fine and few medium roots throughout; common very fine irregular pores; 1 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw3—29.5 to 43.5 inches (75 to 110 centimeters); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; 17 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; common very fine irregular pores; 1 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

C—43.5 to 78.5 inches (110 to 200 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 14 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; common very fine irregular pores; 3 percent gravel and 3 percent cobbles; slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 5 percent gravel

Bw horizons:

Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—very fine sandy loam or fine sandy loam
Clay content—15 to 18 percent

Figure 218.—The Begay, moist soil in map unit 60 (Notom-Begay, moist-Bowington complex, 1 to 6 percent slopes).

Figure 219.—Profile of the Bowington soil in map unit 60 (Notom-Begay, moist-Bowington complex, 1 to 6 percent slopes). Free water is at a depth of 60 centimeters. Scale is in centimeters.

Calcium carbonate equivalent—3 to 5 percent
Rock fragments—0 to 5 percent gravel

C horizon:
Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—5 to 20 percent gravel, cobbles, and stones

Description of the Bowington Soil

Taxonomic classification: Mixed, mesic Oxyaquic Torripsamments (fig. 219)
Landform: Flood plains (fig. 220)
Geology: Quaternary alluvium
Parent material: Mixed alluvium derived from igneous and sedimentary rock
Slope: 1 to 5 percent, north aspect

Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat poorly drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 6.9 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Frequent
Ponding hazard: None
Seasonal water table (minimum depth): About 4 to 8 inches
Runoff class: Very low
Hydrologic group: A/D
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type VIII - B4c Stream Type)
Ecological site number: R035XY021UT
Present vegetation (in most areas): Baltic rush, coyote willow, horsetail, common threesquare, and yellow sweetclover
Land capability classification (nonirrigated areas): 7c
Ground cover (percent):

Plant canopy	80-90
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	5-10
Cyanobacteria crust	0-2
Lichen crust	0

Figure 220.—The Bowington soil in map unit 60 (Notom-Begay, moist-Bowington complex, 1 to 6 percent slopes) on flood plains.

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 483689 meters E., 4225686 meters N., zone 12

C1—0 to 4.5 inches (0 to 12 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 3 percent clay; soft, very friable, nonsticky and nonplastic; many fine roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C2—4.5 to 15.5 inches (12 to 40 centimeters); reddish brown (5YR 5/4) loamy fine sand, yellowish red (5YR 4/6) moist; 7 percent clay; soft, very friable, nonsticky and nonplastic; common fine, common medium, and common coarse roots throughout; many very fine irregular pores; 10 percent coarse distinct irregular black (N 2.5/), moist, iron depletions in matrix; common coarse iron depletions in matrix; 1 percent gravel; very slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C3—15.5 to 78.5 inches (40 to 200 centimeters); reddish brown (5YR 5/4) loamy fine sand, dark reddish brown (5YR 3/4) moist; 7 percent clay; soft, very friable, nonsticky and nonplastic; few fine, common medium, and common coarse roots throughout; many very fine irregular pores; 40 percent very coarse prominent irregular black (N 2.5/), moist, iron depletions in matrix; many very coarse iron depletions in matrix; 5 percent gravel; very slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

C1 horizon:
Clay content—1 to 5 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C2 horizon:
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—1 to 8 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 15 percent gravel

C3 horizon:
Chroma—3 or 4, dry or moist
Texture—sand, fine sand, or loamy fine sand
Clay content—1 to 8 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 35 percent gravel

61—Notom-Aquic Torrifluvents complex, 1 to 20 percent slopes

Map Unit Setting

General setting: Areas by lower parts of Pleasant and Oak Creeks
Major land resource area: 35—Colorado Plateau
Elevation: 5,520 to 5,940 feet (1,682 to 1,810 meters)

Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Notom and similar soils: 50 percent
Aquic Torrifluvents and similar soils: 20 percent
Minor components (30 percent) and their ecological sites:
- Mido soils on stream terraces (very deep, sandy soils); Semidesert Sand (Fourwing Saltbush)
- Riverwash in channels with no vegetation (percentage of this component may vary depending on water level)
- Rock outcrop (Navajo Sandstone)
- Water

Description of the Notom Soil

Taxonomic classification: Sandy-skeletal, mixed, mesic Ustic Torrifluvents (fig. 221)
Landform: Flood-plain steps (fig. 222)
Geology: Quaternary alluvium
Parent material: Alluvium derived from basalt and/or alluvium derived from sandstone
Slope: 1 to 5 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 1.8 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Occasional
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - B4c Stream Type)
Ecological site number: R035XY020UT
Present vegetation (in most areas): Fremont cottonwood, Indian ricegrass, coyote willow, and rubber rabbitbrush
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	10-20
Litter (<5 mm)	5-10
Rock fragments	0-10
Bare soil	60-80
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 487899 meters E., 4226465 meters N., zone 12

Figure 221.—Profile of the Notom soil in map unit 61 (Notom-Aquic Torrifluvents complex, 1 to 20 percent slopes). Scale is in centimeters.

A—0 to 4.5 inches (0 to 12 centimeters); yellowish red (5YR 5/6) loamy fine sand, light reddish brown (5YR 6/4) moist; 3 percent clay; weak very coarse platy structure parting to single grain; slightly hard, very friable, nonsticky and nonplastic; few fine and common very fine roots throughout; many very fine interstitial, many very fine irregular, common fine interstitial, and common fine irregular pores; 5 percent gravel and 5 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C1—4.5 to 14 inches (12 to 35 centimeters); reddish yellow (5YR 6/6) stony loamy fine sand, yellowish red (5YR 5/6) moist; 3 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and few medium roots throughout; many very fine interstitial and many very fine irregular pores; 5 percent gravel and 10 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

Ab—14 to 15 inches (35 to 38 centimeters); light brown (7.5YR 6/4) loamy fine sand, dark brown (7.5YR 3/4) moist; 4 percent clay; massive; slightly hard, very friable,

slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine irregular and many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.2; very abrupt broken boundary.

C2—15 to 59 inches (38 to 150 centimeters); light brown (7.5YR 6/4) extremely stony loamy sand, brown (7.5YR 4/4) moist; 3 percent clay; single grain; slightly hard, very friable, nonsticky and nonplastic; few fine and common medium roots throughout; many very fine interstitial and many very fine irregular pores; 10 percent gravel, 25 percent cobbles, 30 percent stones, and 15 percent boulders; very slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

A and upper C horizons (above a depth of 60 centimeters):
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Clay content—3 to 8 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel, cobbles, and stones

Lower C horizons (below a depth of 60 centimeters):
Hue—5YR or 7.5YR
Value—4 to 6, dry or moist

Figure 222.—The Notom soil in map unit 61 (Notom-Aquic Torrifluvents complex, 1 to 20 percent slopes) on flood-plain steps.

Figure 223.—Profile of the Aquic Torrifluvents in map unit 61 (Notom-Aquic Torrifluvents complex, 1 to 20 percent slopes). The water table is at a depth of 70 centimeters. Scale is in centimeters.

Chroma—4 or 6, dry or moist
Texture—fine sand, loamy fine sand, loamy coarse sand, or loamy sand
Clay content—3 to 8 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 65 percent gravel, cobbles, and stones

Description of the Aquic Torrifluvents

Note: The soils are correlated at the subgroup level because the variability of their characteristics exceeds family class limits.

Taxonomic classification: Aquic Torrifluvents (fig. 223)
Landform: Flood plains (fig. 224)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone

Slope: 2 to 20 percent, southeast to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat poorly drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 3.3 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Frequent
Ponding hazard: None
Seasonal water table (minimum depth): About 20 to 39 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - B4c Stream Type)
Ecological site number: R035XY020UT
Present vegetation (in most areas): Baltic rush, coyote willow, alkali muhly, and common threesquare
Land capability classification (nonirrigated areas): 7w
Ground cover (percent):

Plant canopy	80-90
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	5-10

Figure 224.—The Aquic Torrifluvents in map unit 61 (Notom-Aquic Torrifluvents complex, 1 to 20 percent slopes) on flood plains.

Cyanobacteria crust	0-2
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 488041 meters E., 4226537 meters N., zone 12

C1—0 to 4 inches (0 to 10 centimeters); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; 3 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; common very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—4 to 12 inches (10 to 30 centimeters); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; 3 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine, few fine, and few medium roots throughout; common very fine irregular pores; 5 percent medium distinct irregular iron depletions in matrix; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C3—12 to 17.5 inches (30 to 44 centimeters); reddish brown (5YR 5/4) loamy very fine sand, reddish brown (5YR 4/4) moist; 5 percent clay; massive; slightly hard, very friable, slightly sticky and slightly plastic; common medium roots throughout; many very fine irregular pores; 10 percent coarse prominent irregular iron depletions in matrix; 5 percent gravel; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C4—17.5 to 27.5 inches (44 to 70 centimeters); reddish brown (5YR 5/4) gravelly loamy coarse sand, reddish brown (5YR 4/4) moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; few medium roots throughout; common very fine and common fine irregular pores; 1 percent fine irregular masses of reduced iron on bottom of rock fragments and 20 percent very coarse prominent irregular iron depletions in matrix; 22 percent gravel and 10 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C5—27.5 to 59 inches (70 to 150 centimeters); reddish brown (5YR 5/4) very gravelly loamy coarse sand, reddish brown (5YR 4/4) moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; few medium roots throughout; common very fine and common fine irregular pores; 3 percent medium irregular masses of reduced iron on bottom of rock fragments; 30 percent gravel and 10 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of less than 35 percent

Surface C horizon:
Value—4 to 6, dry or moist
Texture—fine sand, loamy fine sand, or loamy very fine sand
Clay content—1 to 6 percent
Calcium carbonate equivalent—0 to 3 percent
Rock fragments—0 to 5 percent gravel
Electrical conductivity—0 to 2 mmhos/cm

Subsurface C horizons (above a depth of 44 centimeters):
Value—4 to 6, dry or moist
Texture—fine sand, loamy fine sand, loamy very fine sand, or loamy coarse sand

Figure 225.—Landscape of map unit 62 (Parkwash-Rock outcrop complex, 3 to 35 percent slopes).

Clay content—1 to 6 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Subsurface C horizons (below a depth of 44 centimeters):
Chroma—3 or 4, dry or moist
Texture—fine sand, loamy fine sand, loamy very fine sand, or loamy coarse sand
Clay content—1 to 6 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 50 percent gravel

62—Parkwash-Rock outcrop complex, 3 to 35 percent slopes

Map Unit Setting

General setting: Top of the Waterpocket Fold and the Dry Bench area (fig. 225)
Major land resource area: 35—Colorado Plateau
Elevation: 5,840 to 7,640 feet (1,779 to 2,330 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 44 to 46 degrees F (6.7 to 7.8 degrees C)
Mean annual soil temperature: 46 to 48 degrees F (7.8 to 8.9 degrees C)
Frost-free period: 120 to 140 days

Figure 226.—Profile of the Parkwash soil in map unit 62 (Parkwash-Rock outcrop complex, 3 to 35 percent slopes). Hard sandstone bedrock is at a depth of 14 centimeters. Pen is about 14 centimeters in length.

Map Unit Composition

Parkwash and similar soils: 70 percent
Rock outcrop, Navajo Sandstone: 15 percent
Minor components (15 percent) and their ecological sites:
- Pinepoint, dry soils on dunes and sand sheets on mesas (very deep, sandy soils); Upland Sand (Utah Juniper-Pinyon)
- Nizhoni soils on mesas and structural benches (shallow, loamy soils); Upland Shallow Loam (Pinyon-Utah Juniper)

Description of the Parkwash Soil

Taxonomic classification: Mesic, coated Lithic Quartzipsamments (fig. 226)
Landform: Mesas
Geology: Kayenta Formation (Jurassic)
Parent material: Residuum weathered from sandstone and/or eolian sands derived from sandstone
Slope: 3 to 35 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 2 to 8 inches
Drainage class: Somewhat excessively drained
Slowest permeability: More than 20 in/hr (very rapid)
Available water capacity (total inches): About 0.3 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None

Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: D
Calcium carbonate content (maximum): About 1 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Shallow Sand (Pinyon-Utah Juniper)
Ecological site number: R035XY314UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, alderleaf mountain mahogany, green Mormon tea, and Utah serviceberry
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	25-35
Rock fragments	20-30
Bare soil	5-15
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 484482 meters E., 4212142 meters N., zone 12

C1—0 to 1 inch (0 to 3 centimeters); light yellowish brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/6) moist; 2 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; sand coats; noneffervescent, by HCl, 1 normal; neutral, pH 7.0; clear smooth boundary.

C2—1 to 5.5 inches (3 to 14 centimeters); light yellowish brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/6) moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; sand coats; noneffervescent, by HCl, 1 normal; neutral, pH 7.0; abrupt smooth boundary.

R—5.5 to 15.5 inches (14 to 39 centimeters); indurated, unweathered, unfractured sandstone.

Range in Characteristics

AC or C1 horizon:
Hue—5YR, 7.5YR, or 10YR
Value—5 to 8 dry; 4 or 5 moist
Chroma—3 to 6 dry; 4 or 6 moist
Texture—loamy fine sand or fine sand
Clay content—2 to 12 percent
Calcium carbonate equivalent—0 to 1 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

C2 horizon:
Hue—7.5YR or 10YR
Value—6 or 7 dry

Chroma—3 or 4 dry; 2 to 6 moist
Texture—loamy fine sand or fine sand
Clay content—2 to 12 percent
Calcium carbonate equivalent—0 to 1 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

Description of the Rock Outcrop, Navajo Sandstone

This component is characterized by nearly level to strongly sloping rock outcrop with discontinuous cliffs and escarpments. The lithology is noncalcareous sandstone. The vertical relief commonly is a few feet, and the continuity of the cliffs is broken. Typically, there are enough cliffs to impede vehicular travel to some degree. The area can be negotiated by full-sized four-wheeled vehicles with difficulty. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

63—Pherson family-Sandyranch-Riverwash complex, 1 to 30 percent slopes

Map Unit Setting

General setting: Capitol Wash, Grand Wash, and Spring Canyon
Major land resource area: 35—Colorado Plateau
Elevation: 5,230 to 6,750 feet (1,593 to 2,057 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Pherson family and similar soils: 30 percent
Sandyranch and similar soils: 25 percent
Riverwash: 20 percent
Minor components (25 percent) and their ecological sites:
- Arches family soils on structural benches (shallow, sandy soils); Semidesert Shallow Sand (Utah Juniper-Pinyon)
- Moderately deep and deep, sandy-skeletal soils on talus slopes; Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)
- Rock outcrop (Navajo and Kayenta Formation sandstones)

Description of the Pherson Family Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau whereas the Pherson series occurs in MLRA 34B—Warm Central Desertic Basins and Plateaus.

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Ustic Torrifluvents (fig. 227)
Landform: Flood-plain steps (fig. 228)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 2 to 30 percent, north aspect

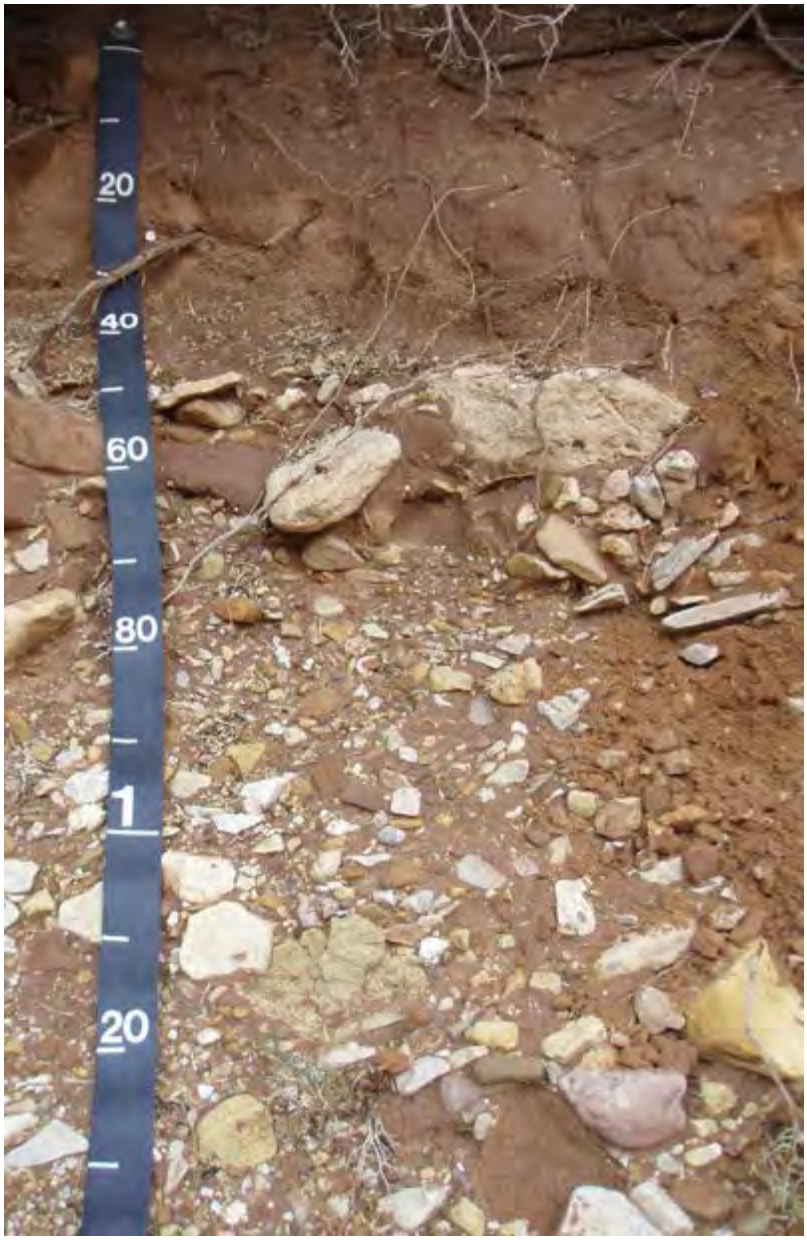

Figure 227.—Profile of the Pherson family soil in map unit 63 (Pherson family-Sandyranch-Riverwash complex, 1 to 30 percent slopes). Scale is in centimeters.

Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 3.6 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Occasional
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A

Figure 228.—The Pherson family soil in map unit 63 (Pherson family-Sandyranch-Riverwash complex, 1 to 30 percent slopes) on stream terraces.

Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Ephemeral Canyon Scrub
Ecological site number: R035XY032UT
Present vegetation (in most areas): Littleleaf mountain mahogany, Apache plume, little bluestem, Indian ricegrass, needle and thread, and Utah serviceberry
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	50-75
Litter (<5 mm)	15-30
Rock fragments	10-25
Bare soil	10-25
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 481165 meters E., 4235086 meters N., zone 12

A—0 to 8 inches (0 to 20 centimeters); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; 9 percent clay; weak very thick platy structure; soft, very friable, slightly sticky and nonplastic; common very fine, common fine,

common medium, and common coarse roots throughout; many very fine and many fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C1—8 to 31.5 inches (20 to 80 centimeters); yellowish red (5YR 5/6) very channery sandy loam, yellowish red (5YR 4/6) moist; 7 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; few fine, common medium, and common coarse roots throughout; many very fine and many fine irregular pores; 5 percent gravel, 10 percent cobbles, and 30 percent channers; slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C2—31.5 to 59 inches (80 to 150 centimeters); reddish yellow (5YR 6/6) extremely cobbly loamy fine sand, yellowish red (5YR 4/6) moist; 6 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; few fine and few medium roots throughout; many very fine and many fine irregular pores; 35 percent gravel, 30 percent cobbles, and 10 percent stones; slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon:

Hue—2.5YR, 5YR, or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, or loamy fine sand
Clay content—5 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizons:

Hue—2.5YR, 5YR, or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Texture—sandy loam, fine sandy loam, or loamy fine sand
Clay content—5 to 12 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 75 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Sandyranch Soil

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 229)
Landform: Stream terraces (fig. 230)
Geology: Quaternary alluvial deposits and eolian sands
Parent material: Alluvium derived from sandstone
Slope: 1 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 6.4 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent

Figure 229.—Profile of the Sandyranch soil in map unit 63 (Pherson family-Sandyranch-Riverwash complex, 1 to 30 percent slopes). Scale is in centimeters.

Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Sandy Bottom (Fourwing Saltbush)
Ecological site number: R035XY015UT
Present vegetation (in most areas): Indian ricegrass, needle and thread, fourwing saltbush, and mesa dropseed
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	40-50
Litter (<5 mm)	15-25
Rock fragments	0
Bare soil	25-35

Cyanobacteria crust	0-15
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 484282 meters E., 4228759 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); yellowish red (5YR 5/6) loamy fine sand, reddish brown (5YR 4/4) moist; 5 percent clay; weak medium platy structure; soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C1—2 to 12 inches (5 to 31 centimeters); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; 5 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—12 to 25.5 inches (31 to 65 centimeters); yellowish red (5YR 5/6) loamy fine sand, reddish brown (5YR 4/4) moist; 7 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Figure 230.—The Sandyranch soil in map unit 63 (Pherson family-Sandyranch-Riverwash complex, 1 to 30 percent slopes) on stream terraces.

C3—25.5 to 71 inches (65 to 180 centimeters); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; 6 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sand, loamy sand, loamy fine sand, or sandy loam
Clay content—3 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

C horizons:
Hue—5YR or 7.5YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—3 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel

Description of the Riverwash

This component consists of unstabilized sandy, silty, gravelly, or cobbly sediment that is flooded, washed, and reworked frequently by rivers and usually deviod of vegetation.

64—Polychrome-Badland-Cerropelon family complex, 15 to 60 percent slopes

Map Unit Setting

General setting: Areas adjacent to Grand Staircase-Escalante National Monument, structural benches, and escarpments below Circle Cliffs
Major land resource area: 35—Colorado Plateau
Elevation: 5,500 to 6,740 feet (1,677 to 2,054 meters)
Mean annual precipitation: 9 to 12 inches (229 to 305 millimeters)
Mean annual air temperature: 45 to 52 degrees F (7.0 to 11.0 degrees C)
Mean annual soil temperature: 47 to 54 degrees F (8.1 to 12.1 degrees C)
Frost-free period: 120 to 160 days

Map Unit Composition

Polychrome and similar soils: 50 percent
Badland, Chinle Formation: 20 percent
Cerropelon family and similar soils: 15 percent
Minor components (15 percent):
Shallow, sandy-skeletal soils on escarpments and structural benches (semidesert, mesic)
Riverwash in channels with no vegetation

Deep and very deep, loamy soils with argillic horizons and calcic horizons on escarpments and structural benches (semidesert, mesic)

Description of the Polychrome Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, nonacid, mesic Ustic Torriorthents
Landform: Escarpments on structural benches
Geology: Chinle Formation (Triassic)
Parent material: Slope alluvium and colluvium derived from shale
Slope: 15 to 60 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Stony Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY246UT
Present vegetation (in most areas): Indian ricegrass, Utah juniper, galleta, green Mormon tea, other shrubs, roundleaf buffaloberry, broom snakeweed, needle and thread, twoneedle pinyon, and Wyoming big sagebrush
Land capability classification (nonirrigated areas): 7s

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477852 meters E., 4195632 meters N., zone 12

A—0 to 17.5 inches (0 to 45 centimeters); brown (7.5YR 5/3) extremely stony very fine sand, brown (7.5YR 4/3) moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; many very fine, many fine, and common medium roots; 10 percent gravel, 15 percent cobbles, and 35 percent stones; noneffervescent; moderately alkaline, pH 8.0; clear irregular boundary.
C—17.5 to 31.5 inches (45 to 80 centimeters); pink (7.5YR 7/4) extremely cobbly fine sandy loam, reddish brown (5YR 5/4) moist; 18 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine, common medium, common coarse, and common very fine roots; 45 percent gravel, 40 percent cobbles, and 5 percent stones; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.
Cr—31.5 inches (80 centimeters); moderately cemented mudstone and shale.

Range in Characteristics

Clay content: 16 to 20 percent
Rock fragments: 40 to 90 percent gravel, cobbles, and stones

A horizon:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist

Clay content—0 to 8 percent
Rock fragments—10 to 15 percent gravel, 10 to 20 percent cobbles, and 30 to 40 percent stones

C horizon:
Hue—5YR or 7.5YR
Rock fragments—15 to 45 percent gravel, 15 to 45 percent cobbles, and 0 to 30 percent stones

This Polychrome soil is considered a taxadjunct to the Polychrome series because it is nonacid whereas the Polychrome series is calcareous. In addition, the Polychrome soil in this map unit occurs in MLRA 35—Colorado Plateau whereas the Polychrome series occurs in MLRA 34B—Warm Central Desertic Basins and Plateaus.

Description of the Badland, Chinle Formation

This component consists of areas of steep, barren exposures of shale or mudstone, usually devoid of vegetation, that are dissected by many intermittent drainage channels. Shallow gullies and severe rilling of the surface are common.

Description of the Cerropelon Family Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau whereas the Cerropelon series occurs in the northern Galisteo Basin part of the Mexican Highlands section of the Basin and Range province in north-central New Mexico (MLRA 36—Southwestern Plateaus, Mesas, and Foothills).

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids
Landform: Escarpments on structural benches
Geology: Chinle Formation (Triassic)
Parent material: Colluvium derived from shale over residuum weathered from shale
Slope: 15 to 60 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 4.2 (low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: C
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Ecological site number: R035XY240UT
Present vegetation (in most areas): Utah juniper, roundleaf buffaloberry, Utah serviceberry, Indian ricegrass, twoneedle pinyon, broom snakeweed, galleta, other shrubs, and singleleaf ash
Land capability classification (nonirrigated areas): 7s

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 4777735 meters E., 4195687 meters N., zone 12

A—0 to 1 inch (0 to 2 centimeters); light brown (7.5YR 6/4) extremely bouldery loam, brown (7.5YR 5/4) moist; 12 percent clay; moderate thick platy structure; soft, very friable, slightly sticky and slightly plastic; 20 percent gravel, 5 percent channers, 10 percent cobbles, 35 percent stones, and 20 percent boulders; noneffervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bw—1 to 17.5 inches (2 to 45 centimeters); strong brown (7.5YR 5/6) very gravelly loam, brown (7.5YR 4/4) moist; 16 percent clay; weak fine granular structure parting to weak medium subangular blocky; soft, very friable, slightly sticky and slightly plastic; common very fine, many fine, common medium, and few coarse roots; 40 percent gravel and 5 percent channers; noneffervescent; moderately alkaline, pH 8.2; clear wavy boundary.

2Bt—17.5 to 32.5 inches (45 to 82 centimeters); reddish brown (5YR 4/4) clay loam, reddish brown (2.5YR 4/4) moist; 27 percent clay; moderate medium angular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few fine and few very fine roots; common very fine and few fine tubular pores; 12 percent gravel; noneffervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Cr—32.5 inches (82 centimeters); weakly cemented mudstone and shale.

Range in Characteristics

Clay content: 20 to 25 percent

Rock fragments: 5 percent channers, 30 percent gravel, 2 percent cobbles, 9 percent stones, and 5 percent boulders

A horizon:

Value—6 dry; 4 or 5 moist
Chroma—4 to 6, dry or moist
Clay content—8 to 18 percent
Rock fragments—15 to 25 percent gravel, 0 to 10 percent channers, 10 to 20 percent cobbles, 25 to 40 percent stones, and 15 to 25 percent boulders

Bw horizon:

Chroma—4 to 6, dry or moist
Clay content—8 to 20 percent
Rock fragments—35 to 45 percent gravel and 0 to 10 percent channers

2Bt horizon:

Hue—2.5YR or 5YR
Clay content—27 to 40 percent
Rock fragments—10 to 15 percent

This Cerropelon soil differs from the Cerropelon series in that it has slopes ranging to 60 percent, has hue of 7.5YR to 2.5YR, and lacks a layer of secondary carbonate accumulation. The Cerropelon series has slopes of 15 to 50 percent, hue of 10YR and 2.5Y, and secondary carbonates beginning at a depth of 10 to 14 inches.

65—Querencia-Lybrook complex, 2 to 35 percent slopes, saline-sodic

Map Unit Setting

General setting: Strike Valley
Major land resource area: 35—Colorado Plateau
Elevation: 5,010 to 5,980 feet (1,526 to 1,823 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)

Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Querencia, saline-sodic and similar soils: 50 percent
Lybrook, saline-sodic and similar soils: 30 percent
Minor components (20 percent) and their ecological sites:
Moderately deep, clayey soils on base slopes of escarpments; Desert Shallow Clay (Mat Saltbush)

Description of the Querencia, Saline-Sodic Soil

Note: A saline-sodic phase and a desert ecological site are assigned to this ustic aridic soil because the high electrical conductivity of the soil and the relatively high exchangable sodium content reduce the amount of water available for uptake by plant roots.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocambids (fig. 231)
Landform: Hills and pediments (fig. 232)
Geology: Mancos Shale (Cretaceous), Blue Gate and Tununk Members
Parent material: Slope alluvium derived from shale over residuum weathered from shale
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 40 to 80 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 3.5 (low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: C
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 30 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Desert Loam (Shadscale)
Ecological site number: R035XY109UT
Present vegetation (in most areas): Indian ricegrass, shadscale, valley saltbush, galleta, and winterfat
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-45
Litter (<5 mm)	5-15
Rock fragments	5-15
Bare soil	35-50
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 494631 meters E., 4202368 meters N., zone 12

Figure 231.—Profile of the Querencia soil in map unit 65 (Querencia-Lybrook complex, 2 to 35 percent slopes, saline-sodic). Scale is in centimeters.

A—0 to 3 inches (0 to 7 centimeters); light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; 20 percent clay; weak thick platy structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; few fine and few very fine roots throughout; many very fine vesicular pores; 1 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Bw—3 to 12 inches (7 to 30 centimeters); light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; 25 percent clay; weak medium and weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and common medium roots throughout; common very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Figure 232.—The Querencia soil in map unit 65 (Querencia-Lybrook complex, 2 to 35 percent slopes, saline-sodic) on pediments and hills.

C—12 to 29.5 inches (30 to 75 centimeters); light olive brown (2.5Y 5/4) sandy loam, olive brown (2.5Y 4/4) moist; 19 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; common very fine irregular pores; 10 percent parachanners; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

2Cyz—29.5 to 55 inches (75 to 140 centimeters); light yellowish brown (2.5Y 6/4) very parachannery silty clay loam, olive brown (2.5Y 4/3) moist; 35 percent clay; massive; hard, firm, moderately sticky and moderately plastic; few fine roots throughout; common very fine irregular pores; common fine irregular salt masses in matrix and common fine irregular gypsum crystals in matrix; 50 percent parachanners; strongly effervescent; slightly alkaline, pH 7.8; gradual smooth boundary.

2Cr—55 to 65 inches (140 to 165 centimeters); weakly cemented shale.

Range in Characteristics

A horizon:

Value—6 or 7 dry; 4 or 5 moist
Chroma—2 or 3, dry or moist
Texture—fine sandy loam, silt loam, loam, or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—1 to 4 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Bw horizon and upper Bk or By horizons (if they occur):
Value—5 to 7 dry; 4 or 5 moist
Chroma—2 to 4, dry or moist
Texture—silt loam, loam, silty clay loam, or sandy clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—5 to 10 percent
Gypsum content—1 to 4 percent
SAR—0 to 5
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon and lower Bk, By, or Bky horizons:
Value—5 to 7 dry; 4 or 5 moist
Chroma—1 to 4, dry or moist
Texture—sandy loam, silt loam, loam, silty clay loam, or clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—5 to 10 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—16 to 30 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Lower C, Cy, and Cyz horizons:
Value—6 or 7 dry; 4 or 5 moist
Chroma—2 or 3, dry or moist
Texture—silt loam, loam, silty clay loam, or clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—5 to 10 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—16 to 30 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers and 15 to 60 percent paragravel or parachanners
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Querencia soil differs from the Querencia series in that it is deep to a paralithic contact, has electrical conductivities up to 30 mmhos/cm, and has SAR up to 20. The Querencia series is very deep and has lower electrical conductivities and sodium absorption ratios.

Description of the Lybrook, Saline-Sodic Soil

Note: A saline-sodic phase and a desert ecological site are assigned to this ustic aridic soil because the high electrical conductivity of the soil reduces the amount of water available for uptake by plant roots.

Taxonomic classification: Fine, mixed, superactive, mesic Ustic Haplocambids (fig. 233)
Landform: Hills and pediments (fig. 244)
Geology: Mancos Shale (Cretaceous), Blue Gate and Tununk Members
Parent material: Slope alluvium derived from shale over residuum weathered from shale
Slope: 9 to 35 percent, northeast to northwest aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 60 inches
Drainage class: Well drained

Figure 233.—Profile of the Lybrook soil in map unit 65 (Querencia-Lybrook complex, 2 to 35 percent slopes, saline-sodic). Scale is in centimeters.

Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 2.5 (very low)
Shrink-swell potential: About 8.5 LEP (high)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 30 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 20 SAR (moderately sodic)
Ecological site name: Desert Clay (Castle Valley Saltbush)
Ecological site number: R035XY103UT
Present vegetation (in most areas): Mat saltbush, Indian ricegrass, Castle Valley clover, desert trumpet, and galleta

Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	15-35
Litter (<5 mm)	0-5
Rock fragments	0-10
Bare soil	55-80
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 497207 meters E., 4195413 meters N., zone 12

Ay—0 to 2.5 inches (0 to 6 centimeters); olive brown (2.5Y 4/3) silty clay loam, dark olive brown (2.5Y 3/3) moist; 34 percent clay; weak thick platy structure; slightly hard, friable, moderately sticky and very plastic; few very fine roots throughout; many very fine interstitial and many very fine irregular pores; common fine irregular gypsum crystals in matrix; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

By—2.5 to 19.5 inches (6 to 49 centimeters); grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; 45 percent clay; strong very coarse prismatic structure; very hard, extremely firm, very sticky and very plastic; few fine and common very fine roots throughout; common fine irregular pores; few very fine

Figure 234.—The Lybrook soil in map unit 65 (Querencia-Lybrook complex, 2 to 35 percent slopes, saline-sodic) on hills and pediments.

irregular gypsum crystals in matrix; strongly effervescent; strongly alkaline, pH 8.8; clear smooth boundary.

BCy—19.5 to 39.5 inches (49 to 100 centimeters); very paragravelly silty clay loam, very dark grayish brown (2.5Y 3/2) moist; 37 percent clay; weak fine subangular blocky structure; friable, very sticky and very plastic; common very fine roots throughout; many very fine interstitial and many very fine irregular pores; few very fine irregular gypsum crystals in matrix; 50 percent paragravel; strongly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Cr—39.5 to 49 inches (100 to 125 centimeters); weakly cemented shale.

Range in Characteristics

Ay horizon:

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—18 to 35 percent
Calcium carbonate equivalent—5 to 10 percent
Gypsum content—1 to 4 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 10 percent gravel or channers

Bky or By horizons:

Value—5 or 6 dry; 3 to 5 moist
Chroma—2 or 3, dry or moist
Texture—silty clay or silty clay loam
Clay content—30 to 45 percent
Calcium carbonate equivalent—5 to 10 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 5 percent paragravel or parachanners

BCy or Cy horizons:

Value—3 to 5, dry or moist
Chroma—1 to 3, dry or moist
Texture—silty clay or silty clay loam
Clay content—35 to 50 percent
Calcium carbonate equivalent—5 to 10 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—16 to 30 mmhos/cm
Rock fragments—0 to 60 percent paragravel or parachanners

This Lybrook soil is considered a taxadjunct to the Lybrook series because it contains a cambic horizon and is classified as an Ustic Haplocambid. The Lybrook series is classified as an Ustic Torriorthent. In addition, the Lybrook soil in this map unit occurs on steeper slopes and at lower temperatures than the Lybrook series and is deep, rather than very deep, to a paralithic contact.

66—Radnik-Kwakina-Pherson family complex, 1 to 15 percent slopes

Map Unit Setting

General setting: Areas near the lower part of the Fremont River
Major land resource area: 35—Colorado Plateau

Elevation: 4,950 to 5,650 feet (1,509 to 1,722 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Radnik and similar soils: 45 percent
Kwakina and similar soils: 25 percent
Pherson family and similar soils: 15 percent
Minor components (15 percent) and their ecological sites:
- Bowington soils on flood plains (deep, coarse-loamy soils with redox features) with Baltic rush, coyote willow, horsetail, common threesquare, and yellow sweetclover; Colorado Plateau Riparian Complex Perennial (Valley Type IV C5/F5 Stream Types)
- Begay, moist and similar soils on stream terraces (very deep, coarse-loamy soils with cambic horizons); Loamy Bottom (Basin Big Sagebrush)
- Water
- Rock outcrop (Navajo Sandstone)
- Riprap on manmade streambanks

Description of the Radnik Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torrifluvents (fig. 235)
Landform: Flood-plain steps (fig. 236)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 1 to 5 percent, north to southeast aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 8.7 (high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Occasional
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - C5/F5 Stream Types)
Ecological site number: R035XY022UT
Present vegetation (in most areas): Fremont cottonwood, basin big sagebrush, fourwing saltbush, Indian ricegrass, and rubber rabbitbrush
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	35-45
Cyanobacteria crust	2-6
Lichen crust	0

Figure 235.—Profile of the Radnik soil in map unit 66 (Radnik-Kwakina-Pherson family complex, 1 to 15 percent slopes). Scale is in centimeters.

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 482207 meters E., 4237387 meters N., zone 12

A—0 to 8 inches (0 to 20 centimeters); light reddish brown (5YR 6/4) very fine sandy loam, yellowish red (5YR 4/6) moist; 14 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; common very fine and common fine

irregular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C1—8 to 37.5 inches (20 to 95 centimeters); light reddish brown (5YR 6/4) fine sandy loam, yellowish red (5YR 4/6) moist; 10 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine, few fine, and common medium roots throughout; common very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; gradual smooth boundary.

C2—37.5 to 59 inches (95 to 150 centimeters); reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 5/4) moist; 7 percent clay; massive; soft, very friable, slightly sticky and nonplastic; common medium and common coarse roots throughout; common very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C3—59 to 65 inches (150 to 165 centimeters); light reddish brown (5YR 6/4) gravelly loamy coarse sand, reddish brown (5YR 4/4) moist; 6 percent clay; single grain; soft, very friable, slightly sticky and nonplastic; common very fine interstitial and common fine irregular pores; 25 percent gravel; slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of less than 35 percent

A horizon:

Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loamy fine sand
Clay content—6 to 15 percent

Figure 236.—The Radnik soil in map unit 66 (Radnik-Kwakina-Pherson family complex, 1 to 15 percent slopes) on flood-plain steps.

Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or cobbles

Upper C horizons (above a depth of 60 inches):
Value—4 or 5 moist
Chroma—4 to 6, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, loamy sand, or loamy fine sand
Clay content—5 to 12 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Lower C horizons (below a depth of 60 inches):
Value—4 or 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—loamy sand or loamy coarse sand
Clay content—3 to 8 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 50 percent gravel or cobbles

Description of the Kwakina Soil

Taxonomic classification: Sandy, mixed, mesic Ustic Torrifluvents (fig. 237)
Landform: Levees and flood-plain steps (fig. 238)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 1 to 5 percent, north to south aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 5.0 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Occasional
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - C5/F5 Stream Types)
Ecological site number: R035XY022UT
Present vegetation (in most areas): Fremont cottonwood, basin big sagebrush, fourwing saltbush, Indian ricegrass, and rubber rabbitbrush
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	35-45
Cyanobacteria crust	2-6

Figure 237.—Profile of the Kwakina soil in map unit 66 (Radnik-Kwakina-Pherson family complex, 1 to 15 percent slopes). Scale is in centimeters.

Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 482406 meters E., 4237343 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; 10 percent clay; weak thin platy structure; soft, very friable, slightly sticky and nonplastic; common very fine, common fine, and few medium roots throughout; common medium, common very fine, and common fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

Figure 238.—The Kwakina soil in map unit 66 (Radnik-Kwakina-Pherson family complex, 1 to 15 percent slopes) on flood-plain steps.

AC—4 to 12.5 inches (10 to 32 centimeters); reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; 6 percent clay; weak thick platy structure; slightly hard, friable, slightly sticky and nonplastic; common very fine, few fine, and common medium roots throughout; common very fine and common fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

C1—12.5 to 37.5 inches (32 to 95 centimeters); reddish yellow (5YR 6/6) loamy sand, yellowish red (5YR 5/6) moist; 5 percent clay; massive; moderately hard, firm, nonsticky and nonplastic; few very fine, few fine, few medium, and few coarse roots throughout; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

C2—37.5 to 53 inches (95 to 135 centimeters); light reddish brown (5YR 6/4) sandy loam, yellowish red (5YR 4/6) moist; 8 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; few fine, few medium, and common coarse roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C3—53 to 59 inches (135 to 150 centimeters); light reddish brown (5YR 6/4) gravelly loamy coarse sand, yellowish red (5YR 4/6) moist; 6 percent clay; single grain; moderately hard, friable, slightly sticky and nonplastic; common very fine and common fine irregular pores; 30 percent gravel; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of less than 35 percent

A and AC horizons:
Hue—5YR, 7.5YR, or 10YR
Value—5 to 8 dry; 4 to 6 moist
Chroma—3 to 6 dry; 4 or 6 moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, loamy fine sand, or fine sand
Clay content—2 to 10 percent
Calcium carbonate equivalent—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Upper C horizons (above a depth of 50 inches):
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, loamy sand, loamy fine sand, or loamy very fine sand
Clay content—3 to 8 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel or cobbles

Lower C horizon (below a depth of 50 inches):
Value—4 or 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—loamy sand or loamy coarse sand
Clay content—3 to 8 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 50 percent gravel or cobbles

Description of the Pherson Family Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau and the Pherson series occurs in MLRA 34B—Warm Central Desertic Basins and Plateaus.

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Ustic Torrifluvents (fig. 239)
Landform: Flood-plain steps (fig. 240)
Geology: Quaternary alluvium
Parent material: Alluvium derived from basalt and/or alluvium derived from sandstone
Slope: 2 to 15 percent, northeast to south aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 5.1 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Very rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)

Figure 239.—Profile of the Pherson family soil in map unit 66 (Radnik-Kwakina-Pherson family complex, 1 to 15 percent slopes). Scale is in centimeters.

Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - C5/F5 Stream Types)
Ecological site number: R035XY022UT
Present vegetation (in most areas): Fremont cottonwood, basin big sagebrush, fourwing saltbush, Indian ricegrass, and rubber rabbitbrush
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	35-45
Cyanobacteria crust	2-6
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 482207 meters E., 4237387 meters N., zone 12

A—0 to 10.5 inches (0 to 27 centimeters); reddish yellow (5YR 6/6) very fine sandy loam, yellowish red (5YR 5/6) moist; 6 percent clay; weak very thick platy structure; slightly hard, friable, slightly sticky and nonplastic; few fine and common very fine roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C1—10.5 to 31.5 inches (27 to 80 centimeters); yellowish red (5YR 5/6) extremely gravelly coarse sandy loam, yellowish red (5YR 4/6) moist; 7 percent clay; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and few medium roots throughout; many very fine interstitial and many fine irregular pores; 75 percent gravel and 10 percent cobbles; slightly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C2—31.5 to 46 inches (80 to 117 centimeters); reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; 6 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; few fine and few medium roots throughout; many very fine irregular pores; 5 percent gravel and 2 percent cobbles; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C3—46 to 59 inches (117 to 150 centimeters); reddish yellow (5YR 6/6) very gravelly sandy loam, yellowish red (5YR 4/6) moist; 6 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; few fine and few micro roots throughout; many very fine irregular pores; 40 percent gravel; slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

Figure 240.—The Pherson family soil in map unit 66 (Radnik-Kwakina-Pherson family complex, 1 to 15 percent slopes) on flood-plain steps.

A horizon:
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, or very fine sandy loam
Clay content—5 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or cobbles

C horizon:
Value—4 to 6, dry or moist
Texture—sandy loam, fine sandy loam, or coarse sandy loam
Clay content—5 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 90 percent gravel or cobbles

67—Radnik-Notom-Oxyaquic Torrifluvents complex, 2 to 10 percent slopes

Map Unit Setting

General setting: Areas along Sulphur Creek, Capitol Reef National Park
Major land resource area: 35—Colorado Plateau
Elevation: 5,400 to 7,100 feet (1,646 to 2,164 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Radnik and similar soils: 50 percent
Notom and similar soils: 25 percent
Oxyaquic Torrifluvents and similar soils: 20 percent
Minor components (5 percent):
Riverwash in channels with no vegetation
Water

Description of the Radnik Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torrifluvents (fig. 241)
Landform: Stream terraces (fig. 242)
Geology: Quaternary alluvium
Parent material: Alluvium derived from basalt and/or alluvium derived from sandstone
Slope: 2 to 10 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 10.2 (very high)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low

Figure 241.—Profile of the Radnik soil in map unit 67 (Radnik-Notom-Oxyaquic Torrifluvents complex, 2 to 10 percent slopes). Scale is in centimeters.

Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): Indian ricegrass, fourwing saltbush, needle and thread, and broom snakeweed
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	10-15
Rock fragments	0-5

Figure 242.—The Radnik soil in map unit 67 (Radnik-Notom-Oxyaquic Torrifluvents complex, 2 to 10 percent slopes) on stream terraces.

Bare soil	50-60
Cyanobacteria crust	0-2
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 473239 meters E., 4239501 meters N., zone 12

A—0 to 5 inches (0 to 13 centimeters); reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; 8 percent clay; weak thick platy structure; soft, very friable, slightly sticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

AC—5 to 9.5 inches (13 to 24 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 11 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine and common medium roots throughout; many very fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

C1—9.5 to 28.5 inches (24 to 73 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 10 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; many very fine interstitial pores; few fine irregular

carbonate masses in matrix; very slightly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

C2—28.5 to 58.5 inches (73 to 148 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 11 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine interstitial pores; few fine irregular carbonate masses in matrix; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C3—58.5 to 73 inches (148 to 185 centimeters); reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; 13 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of less than 35 percent

A horizon:
Chroma—3 to 6 dry; 4 or 6 moist
Texture—fine sandy loam, loamy sand, or loamy fine sand
Clay content—4 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Upper C horizons (above a depth of 50 inches):
Value—3 to 6 dry; 4 or 5 moist
Chroma—5 or 6 dry; 4 or 6 moist
Texture—fine sandy loam, loamy sand, loamy fine sand, or coarse sandy loam
Clay content—4 to 13 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Lower C horizons (below a depth of 50 inches):
Value—4 or 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, loamy sand, loamy fine sand, or coarse sandy loam
Clay content—4 to 13 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Notom Soil

Taxonomic classification: Sandy-skeletal, mixed, mesic Ustic Torrifluvents (fig. 243)
Landform: Flood-plain steps (fig. 244)
Geology: Quaternary alluvium
Parent material: Alluvium derived from volcanic and sedimentary rock
Slope: 2 to 10 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 3.7 (low)
Shrink-swell potential: About 1.5 LEP (low)

Figure 243.—Profile of the Notom soil in map unit 67 (Radnik-Notom-Oxyaquic Torrifluvents complex, 2 to 10 percent slopes) exposed on a cutbank.

Flooding hazard: Occasional
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Negligible
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - C5/F5 Stream Types)
Ecological site number: R035XY022UT
Present vegetation (in most areas): Fremont cottonwood, Indian ricegrass, coyote willow, and rubber rabbitbrush

Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	10-20
Litter (<5 mm)	5-10
Rock fragments	0-5
Bare soil	60-80
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477208 meters E., 4236659 meters N., zone 12

C1—0 to 1 inch (0 to 2 centimeters); reddish brown (5YR 5/4) fine sand, reddish brown (5YR 4/4) moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; common fine and many very fine roots throughout; many very fine interstitial pores; very slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear smooth boundary.

C2—1 to 6 inches (2 to 15 centimeters); reddish brown (5YR 5/4) gravelly loamy fine sand, yellowish red (5YR 4/6) moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common fine and many very fine roots throughout; many very fine interstitial pores; carbonate, finely disseminated throughout; 20 percent gravel and

Figure 244.—The Notom soil in map unit 67 (Radnik-Notom-Oxyaquic Torrifluvents complex, 2 to 10 percent slopes) on flood-plain steps.

5 percent cobbles; slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear smooth boundary.

C3—6 to 71 inches (15 to 180 centimeters); light reddish brown (5YR 6/4) very cobbly loamy fine sand, yellowish red (5YR 4/6) moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; 25 percent gravel and 20 percent cobbles; very slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.6.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

C horizons:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sand, fine sand, loamy fine sand, or fine sandy loam
Clay content—2 to 8 percent
Calcium carbonate equivalent—1 to 3 percent
Rock fragments—0 to 65 percent gravel, cobbles, and stones

Description of the Oxyaquic Torrifluvents

Note: The soils are correlated at the subgroup level because the variability of their characteristics exceeds family class limits.

Taxonomic classification: Oxyaquic Torrifluvents (fig. 245)
Landform: Flood plains (fig. 246)
Geology: Quaternary alluvium
Parent material: Alluvium derived from basalt and/or alluvium derived from sandstone
Slope: 2 to 10 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Moderately well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 3.7 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Occasional
Ponding hazard: None
Seasonal water table (minimum depth): About 39 to 59 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - C5/F5 Stream Types)
Ecological site number: R035XY022UT
Present vegetation (in most areas): Baltic rush, coyote willow, alkali muhly, and common threesquare
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	80-90
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	5-10
Cyanobacteria crust	0-2

Figure 245.—Profile of the Oxyaquic Torrifluvents in map unit 67 (Radnik-Notom-Oxyaquic Torrifluvents complex, 2 to 10 percent slopes). Scale is in centimeters.

Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 472973 meters E., 4239378 meters N., zone 12

C1—0 to 15.5 inches (0 to 39 centimeters); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; 2 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine, few fine, few medium, and few coarse roots throughout; common very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

C2—15.5 to 26.5 inches (39 to 67 centimeters); light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; 4 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and common medium

Figure 246.—The Oxyaquic Torrifluvents in map unit 67 (Radnik-Notom-Oxyaquic Torrifluvents complex, 2 to 10 percent slopes) on flood-plain steps.

roots throughout; common very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

C3—26.5 to 53 inches (67 to 135 centimeters); reddish yellow (5YR 6/6) extremely cobbly loamy fine sand, yellowish red (5YR 4/6) moist; 6 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine irregular pores; 35 percent gravel and 30 percent cobbles; noneffervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

C4—53 to 59 inches (135 to 150 centimeters); reddish yellow (5YR 6/6) extremely cobbly loamy fine sand, yellowish red (5YR 4/6) moist; 6 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine irregular pores; 35 percent gravel and 30 percent cobbles; noneffervescent; slightly alkaline, pH 7.8.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of less than 35 percent

Surface C horizons:

Value—4 or 6, dry or moist
Clay content—1 to 6 percent
Calcium carbonate equivalent—0 to 3 percent
Rock fragments—0 to 5 percent gravel
Electrical conductivity—0 to 2 mmhos/cm

Subsurface C horizons:

Value—4 or 6, dry or moist

Texture—fine sand, loamy fine sand, or fine sandy loam
Clay content—1 to 6 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 65 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

68—Razito-Riverwash complex, 1 to 4 percent slopes

Map Unit Setting

General setting: Sites adjacent to Glen Canyon National Recreation Area along Halls Creek
Major land resource area: 35—Colorado Plateau
Elevation: 3,700 to 3,910 feet (1,129 to 1,193 meters)
Mean annual precipitation: 6 to 10 inches (150 to 250 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days

Map Unit Composition

Razito and similar soils: 55 percent
Riverwash: 40 percent
Minor components (5 percent):
Very deep soils on flood plains and flood-plain steps that have stratified layers of rock fragments and/or textures finer than fine sand (desert, mesic)

Description of the Razito Soil

Taxonomic classification: Mixed, mesic Typic Torripsamments
Landform: Flood plains
Geology: Quaternary alluvium
Parent material: Sandy alluvium
Slope: 1 to 4 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 3.6 (low)
Shrink-swell potential: About 1.0 LEP (low)
Flooding hazard: Rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Sandy Wash 6-10” p.z.
Ecological site number: R035XB216AZ
Present vegetation (in most areas): China tamarisk and rubber rabbitbrush
Land capability classification (nonirrigated areas): 7c
Ground cover (percent):

Plant canopy	13
Litter (<5 mm)	15
Rock fragments	29

Bare soil	37
Cyanobacteria crust	15
Lichen crust	0
Moss crust	0
Salt crust	4
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 456538 meters E., 4109196 meters N., zone 12

A—0 to 1 inch (0 to 3 centimeters); light olive brown (2.5Y 5/3) sand, olive brown (2.5Y 4/3) moist; 3 percent clay; weak thin platy structure; soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; many fine dendritic tubular pores; slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear smooth boundary.

C1—1 to 5 inches (3 to 13 centimeters); light yellowish brown (2.5Y 6/3) sand, olive brown (2.5Y 4/3) moist; 3 percent clay; massive; soft, very friable, nonsticky and nonplastic; many fine and many very fine roots throughout; many fine dendritic tubular pores; slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt smooth boundary.

C2—5 to 7 inches (13 to 18 centimeters); light olive brown (2.5Y 5/3) fine sand, olive brown (2.5Y 4/3) moist; 4 percent clay; massive; soft, very friable, nonsticky and nonplastic; common fine and common medium roots throughout; many medium and many fine dendritic tubular pores; 3 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt smooth boundary.

C3—7 to 36 inches (18 to 91 centimeters); light yellowish brown (2.5Y 6/3) fine sand, olive brown (2.5Y 4/3) moist; 3 percent clay; massive; soft, very friable, nonsticky and nonplastic; many fine and many medium roots throughout; many medium and many fine dendritic tubular pores; 2 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; clear smooth boundary.

C4—36 to 40 inches (91 to 102 centimeters); light yellowish brown (2.5Y 6/3) fine sand, olive brown (2.5Y 4/3) moist; 3 percent clay; massive; moderately hard, friable, nonsticky and nonplastic; common fine and common medium roots throughout; common medium and common fine dendritic tubular pores; 3 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.2; clear smooth boundary.

C5—40 to 60 inches (102 to 152 centimeters); light yellowish brown (2.5Y 6/3) sand, olive brown (2.5Y 4/3) moist; 2 percent clay; massive; moderately hard, friable, nonsticky and nonplastic; common fine roots throughout; common fine dendritic tubular pores; common fine carbonate masses along lamina or strata surfaces; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0.

Range in Characteristics

Reaction: pH 7.4 to 8.4 (slightly alkaline or moderately alkaline)

A horizon:

Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 to 6 moist
Chroma—3 or 4, dry or moist

C horizons:

Hue—10YR or 2.5Y
Value—5 or 6 dry; 4 to 6 moist
Chroma—3 or 4, dry or moist
Texture—sand, fine sand, or loamy sand

Figure 247.—Landscape of map unit 69 (Reef-Retsabal-Rock outcrop complex, 15 to 60 percent slopes) in the foreground.

Clay content—1 to 8 percent
Rock fragments—0 to 25 percent

Description of the Riverwash

Riverwash is unstabilized sandy and/or gravelly sediment that is frequently flooded and washed and subject to shifting and scouring. This material does not support vegetation due to constant shifting and scouring.

69—Reef-Retsabal-Rock outcrop complex, 15 to 60 percent slopes

Map Unit Setting

General setting: The Waterpocket Fold, Capitol Reef National Park (fig. 247)
Major land resource area: 35—Colorado Plateau
Elevation: 5,260 to 8,620 feet (1,604 to 2,627 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Reef and similar soils: 60 percent
Retsabal and similar soils: 15 percent
Rock outcrop, Carmel Formation: 10 percent

Figure 248.—Profile of the Reef soil in map unit 69 (Reef-Retsabal-Rock outcrop complex, 15 to 60 percent slopes). Sandstone bedrock is at a depth of 47 centimeters. Scale is in centimeters.

Minor components (15 percent) and their ecological sites:

Moderately deep, coarse-loamy soils with cambic horizons on pediments; Semidesert Gravelly Loam (Utah Juniper-Pinyon)

Shallow to moderately deep, loamy-skeletal soils with cambic horizons on side slopes; Semidesert Shallow Loam (Utah Juniper-Pinyon)

Mident soils (shallow, sandy soils on structural benches); Semidesert Shallow Sand (Utah Juniper-Pinyon)

Description of the Reef Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 248)

Landform: Pediments (fig. 249)

Geology: Carmel Formation (Jurassic)

Parent material: Residuum weathered from calcareous sandstone

Slope: 15 to 50 percent, north to south aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.0 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 30 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Twoneedle pinyon, Salina wildrye, Utah juniper, green ephedra, blue grama, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-10
Rock fragments	45-65
Bare soil	10-20
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 249.—The Reef soil in map unit 69 (Reef-Retsabal-Rock outcrop complex, 15 to 60 percent slopes) on pediments.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 488788 meters E., 4215077 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); light brown (7.5YR 6/4) channery sandy loam, strong brown (7.5YR 4/6) moist; 13 percent clay; weak medium platy structure; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; common medium, many very fine, and many fine irregular pores; few fine irregular carbonate masses in matrix and common medium irregular carbonate masses on bottom of rock fragments; 25 percent channers; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Bk—3.5 to 17 inches (9 to 43 centimeters); brown (7.5YR 5/4) extremely gravelly loam, strong brown (7.5YR 4/6) moist; 15 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, common fine, common medium, and common coarse roots throughout; many very fine and many fine irregular pores; few fine irregular carbonate masses in matrix and common coarse irregular carbonate masses on bottom of rock fragments; 45 percent gravel and 25 percent channers; violently effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

R—17 to 27 inches (43 to 68 centimeters); indurated, fractured, calcareous sandstone; common fine, common medium, and common coarse roots at top of horizon.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

A horizon:
- Hue—10YR or 7.5YR
- Value—5 to 7 dry; 4 or 5 moist
- Chroma—3 to 6 dry; 4 or 6 moist
- Texture—sandy loam or fine sandy loam
- Clay content—8 to 18 percent
- Calcium carbonate equivalent—5 to 15 percent
- Gypsum content—0 to 2 percent
- Electrical conductivity—0 to 2 mmhos/cm
- Rock fragments—15 to 60 percent gravel or channers

Bk horizon:
- Hue—10YR or 7.5YR
- Value—5 or 6 dry; 4 or 6 moist
- Chroma—3 to 6, dry or moist
- Texture—sandy loam, fine sandy loam, or loam
- Clay content—8 to 18 percent
- Calcium carbonate equivalent—10 to 30 percent
- Gypsum content—0 to 2 percent
- Electrical conductivity—0 to 2 mmhos/cm
- Rock fragments—35 to 75 percent gravel or channers

Description of the Retsabal Soil

Taxonomic classification: Loamy, gypsic, mesic, shallow Leptic Haplogypsids (fig. 250)
Landform: Interfluves and canyon side slopes of dissected pediments (fig. 251)
Geology: Carmel Formation (Jurassic)
Parent material: Eolian deposits derived from sandstone over residuum weathered from rock gypsum
Slope: 25 to 60 percent, north to south aspects

Figure 250.—Profile of the Retsabal soil in map unit 69 (Reef-Retsabal-Rock outcrop complex, 15 to 60 percent slopes). Moderately cemented gypsum bedrock is at a depth of about 10 centimeters. Scale is in 10-centimeter increments.

Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.2 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (maximum): About 3 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Gypsum (Mormontea)
Ecological site number: R035XY237UT
Present vegetation (in most areas): Twoneedle pinyon, Torrey's jointfir, Utah juniper, Bigelow sage, and Fremont's mahonia
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 252)

Plant canopy	5-15
Litter (<5 mm)	0-5
Rock fragments	0-40
Bare soil	30-40
Cyanobacteria crust	10-20
Lichen crust	5-20

Figure 251.—The Retsabal soil in map unit 69 (Reef-Retsabal-Rock outcrop complex, 15 to 60 percent slopes) on side slopes of dissected pediments.

Figure 252.—Typical surface of the Retsabal soil in map unit 69 (Reef-Retsabal-Rock outcrop complex, 15 to 60 percent slopes).

Moss crust	0
Salt crust	0
Gypsum crust	0-10

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 488576 meters E., 4225957 meters N., zone 12

Ay—0 to 4 inches (0 to 10 centimeters); pinkish white (7.5YR 8.5/2) gypsiferous loamy sand, pink (7.5YR 8/3) moist; 3 percent clay; weak fine subangular blocky structure; nonsticky and nonplastic; many very fine irregular, many very fine vesicular, and many fine irregular pores; 5 percent gravel; very slightly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

Cr—4 to 14 inches (10 to 35 centimeters); strongly cemented gypsum.

Range in Characteristics

Note: Some pedons may have a Cy horizon above the Cr horizon

Ay horizon:

Hue—10YR or 7.5YR
Value—6 to 8.5 dry; 4 to 8 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, or loamy sand
Clay content—3 to 15 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—15 to 30 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Retsabal soil is considered a taxadjunct of the Retsabal series because it contains between 15 and 30 percent gypsum, thus meeting the criteria for the gypsic mineralogy class. The Retsabal series typically contains more than 40 percent gypsum and is in the hypergypsic mineralogy class and the fine-gypseous particle-size class.

Description of the Rock Outcrop, Carmel Formation

This component is characterized by strongly sloping to steep rock outcrop. The lithology is sandstone, limestone, and gypsum. The vertical relief ranges from a few feet to several feet, and the continuity of cliffs is broken. Typically, the area is steep enough and there are enough cliffs to make travel by full-sized four-wheeled vehicles very difficult. There are usually no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

70—Reef-Rock outcrop complex, 15 to 60 percent slopes

Map Unit Setting

General setting: Burr Trail area, Capitol Reef National Park (fig. 253)
Major land resource area: 35—Colorado Plateau
Elevation: 4,710 to 6,980 feet (1,436 to 2,128 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Figure 253.—Landscape of map unit 70 (Reef-Rock outcrop complex, 15 to 60 percent slopes). This map unit is on dissected hillslopes.

Map Unit Composition

Reef and similar soils: 70 percent
Rock outcrop, Moenkopi Formation sandstone: 15 percent
Minor components (15 percent) and their ecological sites:
- Bullpen soils on side slopes (moderately deep, loamy soils); Semidesert Shallow Loam (Utah Juniper-Pinyon)
- Simel soils on side slopes and structural benches (shallow, loamy soils); Semidesert Shallow Loam (Utah Juniper-Pinyon)

Description of the Reef Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 254)
Landform: Deeply dissected hillslopes on plateaus and mountain slopes
Geology: Moenkopi Formation (Lower Triassic)
Parent material: Colluvium derived from sandstone over residuum weathered from sandstone
Slope: 15 to 60 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 8 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.5 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches

Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 20 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Ecological site number: R035XY240UT
Present vegetation (in most areas): Utah juniper, twoneedle pinyon, green Mormon tea, Bigelow sage, and desert needlegrass

Figure 254.—Profile of the Reef soil in map unit 70 (Reef-Rock outcrop complex, 15 to 60 percent slopes). Bedrock is at a depth of 25 centimeters. Scale is in centimeters.

Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-10
Rock fragments	50-70
Bare soil	5-15
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 493935 meters E., 4190158 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); light brown (7.5YR 6/4) very channery fine sandy loam, brown (7.5YR 4/4) moist; 13 percent clay; weak medium granular and weak thin platy structure; slightly hard, friable, slightly sticky and nonplastic; common very fine, common fine, and common medium roots in cracks; few medium, common very fine, and few fine irregular pores; 35 percent channers and 20 percent flagstones; violently effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C—4 to 10 inches (10 to 25 centimeters); light brown (7.5YR 6/4) extremely flaggy fine sandy loam, brown (7.5YR 4/4) moist; 17 percent clay; massive; soft, friable, slightly sticky and nonplastic; common very fine roots in cracks; 40 percent channers and 40 percent flagstones; violently effervescent; moderately alkaline, pH 8.4; abrupt irregular boundary.

R—10 to 19.5 inches (25 to 50 centimeters); very strongly cemented sandstone.

Range in Characteristics

A horizon:
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—10 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—30 to 60 percent gravel, channers, and flagstones

C horizon:
Hue—7.5YR or 10YR
Value—5 to 8 dry; 4 to 6 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—10 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 80 percent gravel, channers, and flagstones

Description of the Rock Outcrop, Moenkopi Formation Sandstone

This component is characterized by gently sloping to steep rock outcrop. The lithology is sandstone. The vertical relief ranges from a few feet to several feet, and the continuity of cliffs is broken. Typically, the area is steep enough and there are

Figure 255.—An area of map unit 71 (Reef-Rock outcrop complex, 25 to 50 percent slopes) on dissected hogbacks at the base of the Waterpocket Fold.

enough cliffs to make travel by full-sized four-wheeled vehicles very difficult. Travel by a small ATV or motorcycle is usually possible though difficult. There are usually no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

71—Reef-Rock outcrop complex, 25 to 50 percent slopes

Map Unit Setting

General setting: Base of the Waterpocket Fold, Capitol Reef National Park (fig. 255)
Major land resource area: 35—Colorado Plateau
Elevation: 5,040 to 6,340 feet (1,537 to 1,933 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Reef and similar soils: 75 percent
Rock outcrop, Carmel Formation sandstone: 10 percent
Minor components (15 percent) and their ecological sites:
- Arches soils on coppice dunes on structural benches and cuestas (shallow, sandy soils with mixed mineralogy); Semidesert Shallow Sand (Utah Juniper-Pinyon)

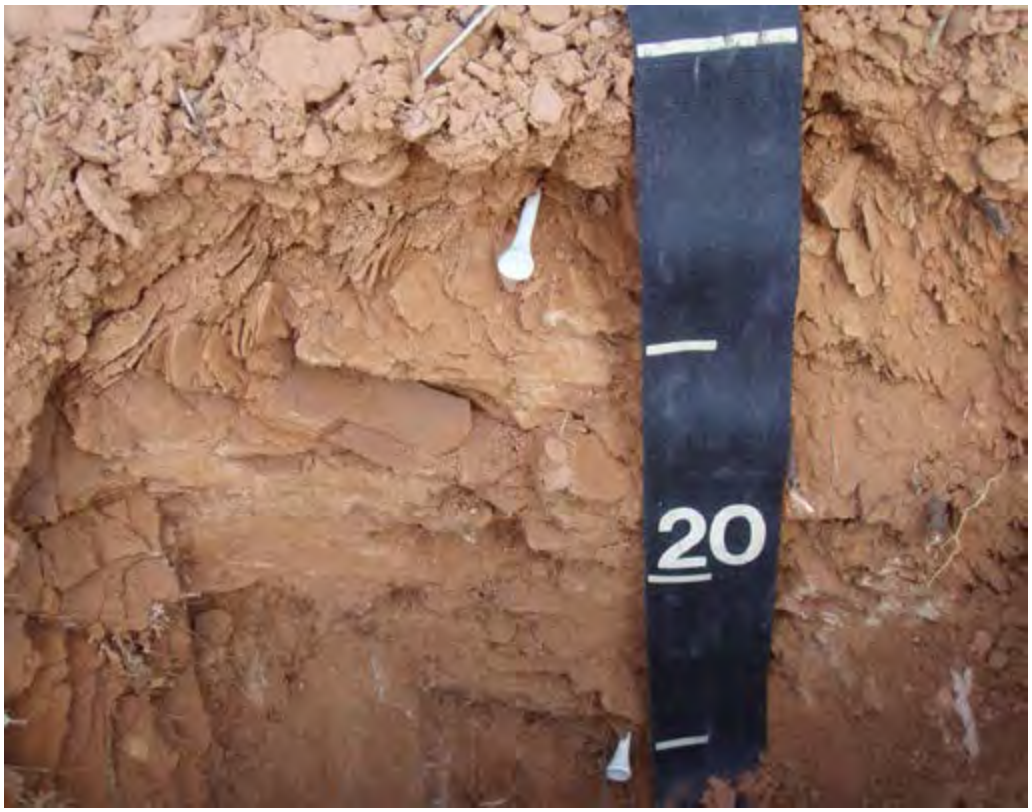

Figure 256.—Profile of the Reef soil in map unit 71 (Reef-Rock outcrop complex, 25 to 50 percent slopes). Scale is in centimeters.

Nalcase soils on sand sheets on cuestas (shallow, sandy soils with siliceous mineralogy); Shallow Sand Rock Pocket (Utah Juniper/Two-Needle Pinyon)

Description of the Reef Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 256)
Landform: Cuestas or hogbacks
Geology: Carmel Formation sandstone (Jurassic)
Parent material: Colluvium derived from sandstone and/or residuum weathered from sandstone
Slope: 25 to 50 percent, northeast to southeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.7 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 45 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)

Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Ecological site number: R035XY240UT
Present vegetation (in most areas): Utah juniper, Salina wildrye, broom snakeweed, crispleaf buckwheat, Indian ricegrass, twoneedle pinyon, and galleta
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	10-20
Rock fragments	35-50
Bare soil	15-25
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 495726 meters E., 4194964 meters N., zone 12

C1—0 to 2 inches (0 to 5 centimeters); red (2.5YR 4/6) very channery sandy loam, dark red (2.5YR 3/6) moist; 15 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 40 percent channers; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.
C2—2 to 11.5 inches (5 to 29 centimeters); red (2.5YR 4/6) very channery sandy loam, dark red (2.5YR 3/6) moist; 15 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 55 percent channers; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.
R—11.5 to 21.5 inches (29 to 54 centimeters); very strongly cemented calcareous sandstone.

Range in Characteristics

C1 horizon:
Hue—2.5YR or 5YR
Value—4 to 6 dry; 3 or 4 moist
Chroma—4 or 6 dry; 3 to 6 moist
Texture—sandy loam or fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—10 to 45 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel or channers

C2 horizon:
Hue—5YR, 7.5YR, or 10YR
Value—5 or 6 dry; 3 to 5 moist
Chroma—4 or 6, dry or moist
Clay content—8 to 18 percent
Calcium carbonate equivalent—10 to 45 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel or channers

Description of the Rock Outcrop, Carmel Formation Sandstone

This component is characterized by strongly sloping to steep rock outcrop. The lithology is sandstone, siltstone, calcareous mudstone, gypsiferous siltstone, and limestone (Carmel Formation). The vertical relief ranges from a few feet to several feet, and the continuity of the cliffs is broken. Typically, the area is steep enough and there are enough cliffs to make travel by full-sized four-wheeled vehicles very difficult. Travel by a small ATV or motorcycle is usually possible though difficult. There are usually no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

72—Reef-Rock outcrop complex, 30 to 60 percent slopes, extremely bouldery

Map Unit Setting

General setting: Sites adjacent to Glen Canyon National Recreation Area at the top of the Waterpocket Fold
Major land resource area: 35—Colorado Plateau
Elevation: 4,030 to 7,020 feet (1,228 to 2,140 meters)
Mean annual precipitation: 10 to 14 inches (250 to 350 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.0 to 13.0 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.1 to 14.1 degrees C)
Frost-free period: 135 to 165 days

Map Unit Composition

Note: This map unit is assigned an extremely bouldery phase because 20 to 35 percent of the soil surface is covered by stones and boulders.

Reef and similar soils: 65 percent
Rock outcrop: 30 percent
Minor components (5 percent):
- Rizno soils on structural benches (shallow, loamy soils) (semidesert, mesic)
- Soils with textures coarser than fine sandy loam on structural benches (semidesert, mesic)

Description of the Reef Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Talus slopes
Geology: Kayenta and Navajo Formations sandstone (Jurassic)
Parent material: Sandy and gravelly talus derived from sandstone and shale
Slope: 30 to 60 percent, northeast to northwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 0.4 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 2 percent
Salinity maximum: About 0 mmhos/cm (nonsaline)

Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)
Ecological site number: R035XY263UT
Present vegetation (in most areas): Singleleaf ash, Utah juniper, Utah serviceberry, desert princesplume, sumac, and desert needlegrass
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	37
Litter (<5 mm)	3
Rock fragments	80
Bare soil	7
Cyanobacteria crust	1
Lichen crust	1
Moss crust	1
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 586386 meters E., 4232074 meters N., zone 12

C—0 to 4 inches (0 to 10 centimeters); reddish brown (5YR 4/4) very channery loam, dark reddish brown (5YR 3/4) moist; 15 percent clay; massive; slightly hard, friable, moderately sticky and slightly plastic; common very fine and fine roots throughout; many very fine and common fine interstitial pores; 50 percent channers; slightly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.
R1—4 to 13 inches (10 to 33 centimeters); unweathered, fractured sandstone; common fine roots in cracks.
R2—13 to 23 inches (33 to 58 centimeters); unweathered, unfractured sandstone; common medium roots at top of horizon.

Range in Characteristics

Reaction: pH 7.9 to 8.4 (moderately alkaline)

C horizon:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—loam or fine sandy loam
Clay content—8 to 18 percent
Rock fragments—35 to 75 percent

Description of the Rock Outcrop

This component consists of sandstone bedrock that is typically exposed on ledges and cliff faces (Moenkopi Formation or Wingate Sandstone). It also includes areas where the depth to bedrock is less than 4 inches (10 centimeters).

73—Reef-Rock outcrop complex, 6 to 20 percent slopes

Map Unit Setting

General setting: Burr Trail and Meeks Mesa areas, Capitol Reef National Park (fig. 257)
Major land resource area: 35—Colorado Plateau

Figure 257.—Landscape of map unit 73 (Reef-Rock outcrop complex, 6 to 20 percent slopes).

Elevation: 4,990 to 7,540 feet (1,520 to 2,297 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Reef and similar soils: 40 percent
Rock outcrop, Kayenta Formation: 40 percent
Minor components (20 percent) and their ecological sites:
- Reef soils on structural benches (shallow, loamy-skeletal soils); Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
- Deep and very deep, sandy-skeletal soils on canyon side slopes; Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)
- Riverwash in channels with no vegetation

Description of the Reef Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 258)
Landform: Dip slopes of cuestas and structural benches
Geology: Kayenta Formation (Jurassic)
Parent material: Residuum weathered from sandstone
Slope: 6 to 20 percent, east to west aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)

Available water capacity (total inches): About 0.3 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, twoneedle pinyon, broom snakeweed, blackbrush, desert needlegrass, green ephedra, Indian ricegrass, and Stansbury cliffrose
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	10-15
Rock fragments	10-20
Bare soil	40-55
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

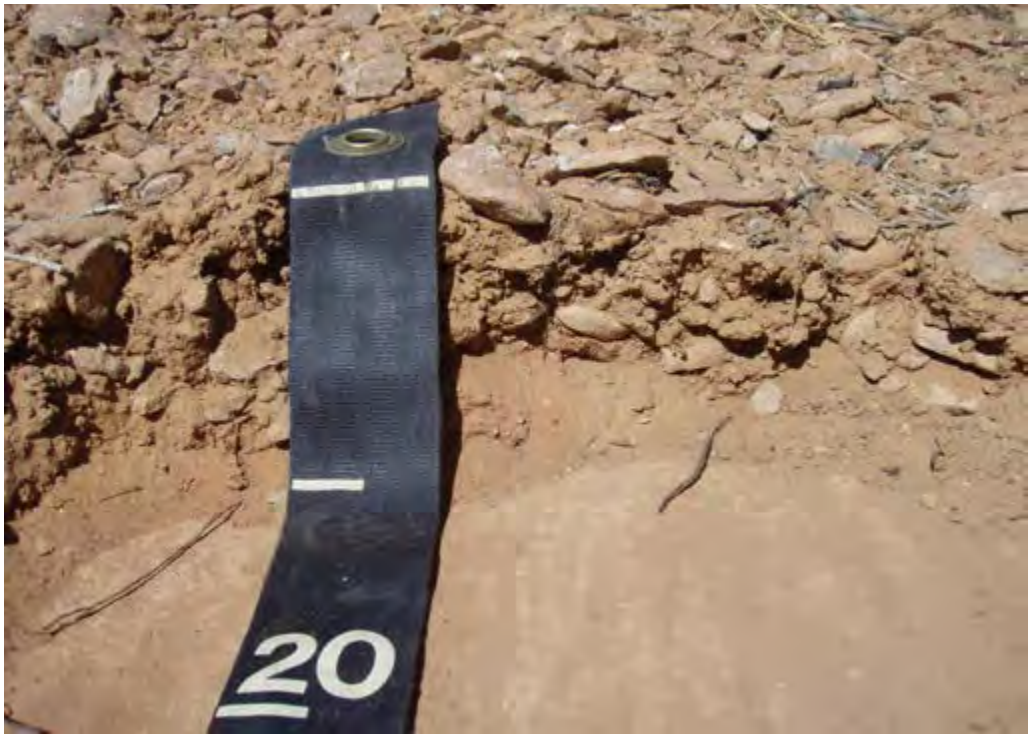

Figure 258.—Profile of the Reef soil in map unit 73 (Reef-Rock outcrop complex, 6 to 20 percent slopes). Bedrock is at a depth of 10 centimeters. Scale is in centimeters.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 498105 meters E., 4188304 meters N., zone 12

C—0 to 4 inches (0 to 10 centimeters); yellowish red (5YR 5/6) very gravelly sandy loam, yellowish red (5YR 4/6) moist; 10 percent clay; massive; soft, very friable, slightly sticky and nonplastic; common fine roots; common very fine irregular pores; 40 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; very abrupt smooth boundary.

R—4 to 14 inches (10 to 35 centimeters); indurated, unfractured sandstone; common very fine roots at top of horizon.

Range in Characteristics

Note: Some pedons may contain a thin A horizon

C horizon:

Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Texture—sandy loam or fine sandy loam
Clay content—8 to 15 percent
Calcium carbonate equivalent—1 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 75 percent gravel or channers

Description of the Rock Outcrop, Kayenta Formation

This component is characterized by nearly level to strongly sloping rock outcrop with many cliffs and escarpments. The vertical relief is commonly a few feet, and the continuity of the cliffs is broken. Typically, there are enough cliffs to make vehicular travel nearly impossible. The impediment to foot travel or to animals is usually slight to moderate. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

74—Reef, warm-Rock outcrop-Lemrac complex, 20 to 65 percent slopes

Map Unit Setting

General setting: Base of the Waterpocket Fold
Major land resource area: 35—Colorado Plateau
Elevation: 3,880 to 5,310 feet (1,183 to 1,620 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 52 to 54 degrees F (11.1 to 12.2 degrees C)
Mean annual soil temperature: 54 to 56 degrees F (12.2 to 13.3 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Reef, warm and similar soils: 40 percent
Rock outcrop, Carmel Formation sandstone: 25 percent
Lemrac and similar soils: 15 percent
Minor components (20 percent) and their ecological sites:

Rizno, steep soils on dip slopes of cuestas (shallow, loamy soils); Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Sandyranch family soils on stream terraces (deep and very deep, sandy soils); Semidesert Sand (Fourwing Saltbush)

Figure 259.—The Reef, warm soil in map unit 74 (Reef, warm-Rock outcrop-Lemrac complex, 20 to 65 percent slopes).

Deep, loamy-skeletal soils with argillic horizons on dip slopes of cuestas; Semidesert Stony Loam (Blackbrush)

Arches soils on structural benches (shallow, sandy soils); Shallow Sand Rock Pocket (Utah Juniper/Two-Needle Pinyon)

Description of the Reef, Warm Soil

Note: This component is assigned a warm phase because it supports a vegetative community that contains blackbrush.

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Dip slopes of hogbacks or cuestas (fig. 259)
Geology: Carmel Formation (Jurassic)
Parent material: Colluvium derived from sandstone over residuum weathered from sandstone
Slope: 20 to 35 percent, northeast to southeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 2 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.2 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D

Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Very Shallow Gravelly Loam (Utah Juniper)
Ecological site number: R035XY235UT
Present vegetation (in most areas): Blackbrush, Utah juniper, green ephedra, and low rabbitbrush
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-35
Litter (<5 mm)	2-7
Rock fragments	50-70
Bare soil	5-15
Cyanobacteria crust	0-10
Lichen crust	0-10
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 502470 meters E., 4183381 meters N., zone 12

C—0 to 4 inches (0 to 10 centimeters); red (2.5YR 4/6) extremely gravelly fine sandy loam, dark red (2.5YR 3/6) moist; 14 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine and many fine irregular pores; 65 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.
R—4 to 14 inches (10 to 35 centimeters); indurated, fractured, calcareous sandstone.

Range in Characteristics

Note: Some pedons may contain a thin A horizon

C horizon:
Hue—2.5YR or 5YR
Value—4 to 6 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Gypsum content—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 75 percent gravel or channers

Description of the Rock Outcrop, Carmel Formation Sandstone

This component is characterized by strongly sloping to steep rock outcrop with discontinuous cliffs and escarpments. The lithology is interbedded sandstone, siltstone, and gypsum (Carmel Formation). The vertical relief ranges from a few feet to several feet, and the continuity of cliffs is broken. Typically, the area is steep enough and there are enough cliffs to make travel by full-sized four-wheeled vehicles very difficult. Travel by a small ATV or motorcycle may be possible though difficult. There are usually no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

Figure 260.—Profile of the Lemrac soil in map unit 74 (Reef, warm-Rock outcrop-Lemrac complex, 20 to 65 percent slopes). Bedrock is at a depth of 80 centimeters. Scale is in centimeters.

Description of the Lemrac Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Leptic Haplogypsids (fig. 260)
Landform: Dip slopes of hogbacks or cuestas (fig. 261)
Geology: Carmel Formation (Jurassic)
Parent material: Residuum weathered from rock gypsum
Slope: 35 to 65 percent, north to east aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 4.1 (low)

Figure 261.—Landscape of the Lemrac soil in map unit 74 (Reef, warm-Rock outcrop-Lemrac complex, 20 to 65 percent slopes).

Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: B
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Gypsum (Torrey's Jointfir)
Ecological site number: R035XY264UT
Present vegetation (in most areas): Torrey's jointfir, blackbrush, shadscale, Indian ricegrass, and low rabbitbrush
Land capability classification (nonirrigated areas): 7e
Ground cover (percent): (figs. 262 and 263)

Plant canopy	30-35
Litter (<5 mm)	5-10
Rock fragments	5-10
Bare soil	10-20
Cyanobacteria crust	10-15
Lichen crust	5-10
Moss crust	0
Salt crust	0
Gypsum crust	0-5

Figure 262.—Typical surface of the Lemrac soil in map unit 74 (Reef, warm-Rock outcrop-Lemrac complex, 20 to 65 percent slopes) exhibiting robust biological crust.

Figure 263.—A close-up of lichen crust on the Lemrac soil in map unit 74 (Reef, warm-Rock outcrop-Lemrac complex, 20 to 65 percent slopes).

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 497964 meters E., 4190129 meters N., zone 12

Ay—0 to 3.5 inches (0 to 9 centimeters); pink (5YR 7/4) very fine sandy loam, reddish brown (5YR 5/4) moist; 10 percent clay; weak very thick platy structure; slightly hard, friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine irregular pores; few very fine irregular gypsum masses in matrix; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

By1—3.5 to 12 inches (9 to 30 centimeters); light reddish brown (5YR 6/4) paragravelly very fine sandy loam, dark reddish brown (5YR 3/4) moist; 8 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; many very fine, common fine, and common medium roots throughout; many very fine irregular and many fine interstitial pores; common very fine irregular gypsum crystals in matrix; 30 percent paragravel; slightly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

By2—12 to 20.5 inches (30 to 52 centimeters); reddish brown (5YR 5/4) paragravelly fine sandy loam, reddish brown (5YR 4/4) moist; 10 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine to medium roots throughout; common very fine irregular and common fine interstitial pores; common medium irregular gypsum crystals in matrix; 25 percent paragravel; slightly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Cy—20.5 to 31.5 inches (52 to 80 centimeters); light reddish brown (5YR 6/4), reddish yellow, (5YR 6/6), and light gray (10YR 7/2) very parachannery sandy loam, reddish brown (5YR 4/3), light gray (10YR 7/2), and yellowish red (5YR 4/6) moist; 12 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; common fine roots in cracks; common very fine irregular and common fine interstitial pores; common coarse irregular gypsum crystals in matrix; 50 percent parachanners; slightly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Cr—31.5 to 41.5 inches (80 to 105 centimeters); moderately cemented decomposed gypsum.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of less than 35 percent

A horizon:

Hue—5YR or 7.5YR
Value—6 or 7 dry; 4 or 5 moist
Texture—sandy loam, fine sandy loam, or very fine sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—5 to 10 percent
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers

By horizons:

Hue—5YR, 7.5YR, or 10YR
Value—5 to 7 dry; 3 to 6 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, or very fine sandy loam
Clay content—5 to 18 percent

Calcium carbonate equivalent—1 to 10 percent
Gypsum content—5 to 20 percent
Electrical conductivity—0 to 4 mmhos/cm
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)
Rock fragments—0 to 50 percent gravel, channers, paragravel, or parachanners

Cy horizon:
Hue—5YR, 7.5YR, or 10YR
Value—6 to 9 dry; 4 to 8 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, fine sandy loam, or very fine sandy loam
Clay content—5 to 18 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—5 to 20 percent
Electrical conductivity—0 to 4 mmhos/cm
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)
Rock fragments—0 to 50 percent gravel, channers, paragravel, or parachanners

This Lemrac soil is considered a taxadjunct to the Lemrac series because it has mixed mineralogy whereas the Lemrac series has hypergypsic mineralogy.

75—Reef-Rizno-Rock outcrop complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Miners Mountain and Burr Trail areas, Capitol Reef National Park (fig. 264)
Major land resource area: 35—Colorado Plateau
Elevation: 5,520 to 7,380 feet (1,681 to 2,250 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Reef and similar soils: 45 percent
Rizno and similar soils: 40 percent
Rock outcrop, Moenkopi Formation sandstone: 10 percent
Minor components (5 percent) and their ecological sites:
Simel soils on structural benches (shallow, loamy soils); Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Chilton soils on terrace remnants (very deep soils with more than 35 percent rock fragments); Semidesert Loam (Shadscale)
Riverwash with no vegetation
Ignacio family soils on structural benches (moderately deep, coarse-loamy soils); Semidesert Shallow Loam (Utah Juniper-Pinyon)

Description of the Reef Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Ridgetops and footslopes of mountain slopes and structural benches
Geology: Moenkopi Formation (Lower Triassic)
Parent material: Slope alluvium derived from sandstone and siltstone over residuum weathered from sandstone and siltstone

Figure 264.—Landscape of map unit 75 (Reef-Rizno-Rock outcrop complex, 2 to 15 percent slopes). This map unit is on ridgetops.

Slope: 2 to 15 percent, northeast to southeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.7 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 30 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, twoneedle pinyon, galleta, and green Mormon tea
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	10-20
Rock fragments	30-40
Bare soil	15-25
Cyanobacteria crust	0

Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 494608 meters E., 4190005 meters N., zone 12

A—0 to 3 inches (0 to 8 centimeters); brown (7.5YR 5/4) very channery fine sandy loam, brown (7.5YR 4/4) moist; weak fine platy structure parting to moderate fine and medium granular; slightly hard, friable, moderately sticky and moderately plastic; few fine and common very fine roots; few very fine and common fine and medium pores; 40 percent channers; violently effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

C—3 to 8 inches (8 to 20 centimeters); brown (7.5YR 5/4) very channery fine sandy loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; common very fine and fine and common medium roots; few very fine pores; 45 percent channers and 10 percent flagstones; violently effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

R—8 to 18 inches (20 to 45 centimeters); very strongly cemented sandstone.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

Note: Some pedons may not have an A horizon

A horizon:

Hue—10YR or 7.5YR
Value—5 or 6 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—12 to 27 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 60 percent gravel or channers
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon:

Hue—10YR or 7.5YR
Value—5 or 6 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—12 to 27 percent
Calcium carbonate equivalent—5 to 30 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 60 percent gravel, channers, or flagstones
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Rizno Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 265)

Landform: Ridgetops and footslopes of mountain slopes and structural benches

Geology: Moenkopi Formation (Lower Triassic)

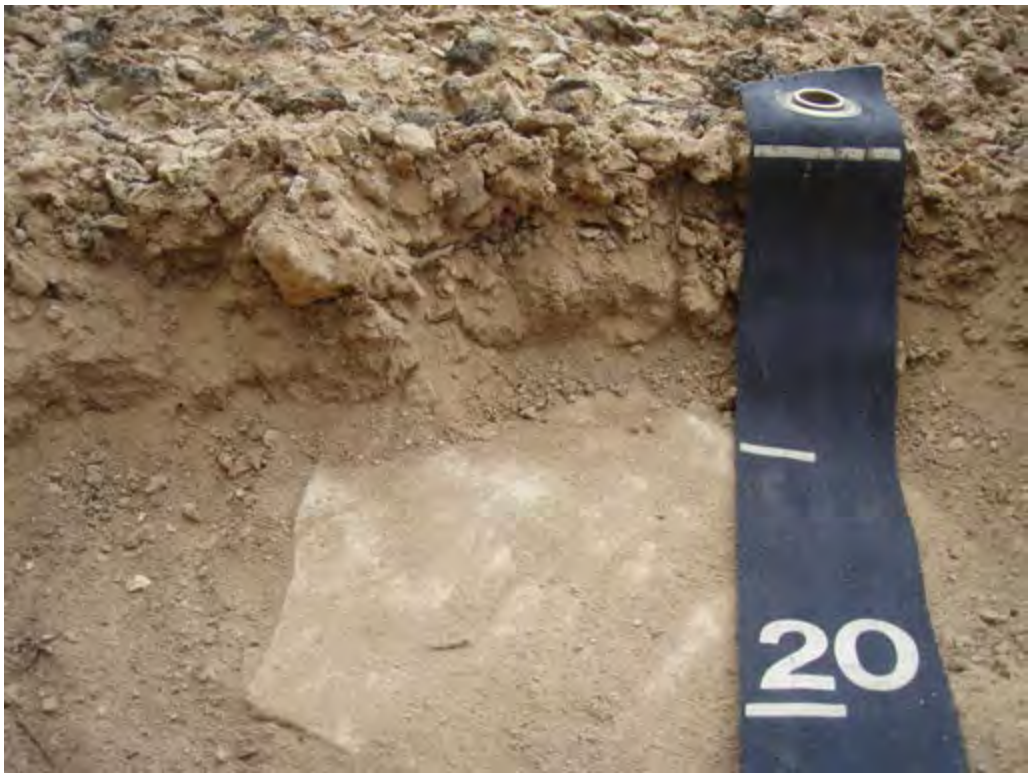

Figure 265.—Profile of the Rizno soil in map unit 75 (Reef-Rizno-Rock outcrop complex, 2 to 15 percent slopes). Bedrock is at a depth of 10 centimeters. Scale is in centimeters.

Parent material: Slope alluvium derived from sandstone and siltstone over residuum weathered from sandstone and siltstone
Slope: 2 to 15 percent, northeast to southeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.4 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, twoneedle pinyon, galleta, and green Mormon tea
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 266)

Plant canopy	20-30
Litter (<5 mm)	10-20
Rock fragments	30-40

Bare soil	15-25
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 493991 meters E., 4191683 meters N., zone 12

C—0 to 4 inches (0 to 10 centimeters); strong brown (7.5YR 5/6) gravelly fine sandy loam, strong brown (7.5YR 4/6) moist; 14 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; 20 percent gravel; violently effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

R—4 to 14 inches (10 to 35 centimeters); very strongly cemented fractured sandstone.

Range in Characteristics

Note: Some pedons may have an A horizon at the soil surface

C horizon:

Hue—10YR, 7.5YR, or 5YR
Value—5 or 6 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, sandy loam, or loam
Clay content—10 to 27 percent

Figure 266.—Typical surface of the Rizno soil in map unit 75 (Reef-Rizno-Rock outcrop complex, 2 to 15 percent slopes).

Figure 267.—Landscape of map unit 76 (Remorris sandy loam, 2 to 60 percent slopes). This map unit is on hills along the Scenic Drive.

Calcium carbonate equivalent—5 to 15 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 35 percent gravel or channers

This Rizno soil differs from the Rizno series in that it has hue of 7.5YR and 10YR whereas the Rizno series typically has hue of 5YR and 2.5YR.

Description of the Rock Outcrop, Moenkopi Formation Sandstone

This component is characterized by gently sloping to steep rock outcrop. The lithology is sandstone. The vertical relief ranges from a few feet to several feet, and the continuity of cliffs is broken. Typically, the area is steep enough and there are enough cliffs to make travel by full-sized four-wheeled vehicles very difficult. Travel by a small ATV or motorcycle is usually possible though difficult. There are usually no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

76—Remorris sandy loam, 2 to 60 percent slopes

Map Unit Setting

General setting: Scenic Drive, Capitol Reef National Park (fig. 267)
Major land resource area: 35—Colorado Plateau
Elevation: 5,460 to 6,330 feet (1,665 to 1,928 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)

Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Remorris and similar soils: 85 percent
Minor components (15 percent) and their ecological sites:
- Moderately deep, fine-loamy soils on hills; Semidesert Shallow Sandy Loam (Shadscale)
- Very deep, loamy-skeletal soils on alluvial fans and base slopes of escarpments; Semidesert Gravelly Loam (Utah Juniper-Pinyon)

Description of the Remorris Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 268)
Landform: Low hills
Geology: Moenkopi Formation sandstone (Triassic)
Parent material: Residuum weathered from siltstone
Slope: 2 to 60 percent, north to west aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 10 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 1.9 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sandy Loam (Shadscale)
Ecological site number: R035XY230UT
Present vegetation (in most areas): Shadscale, Torrey's jointfir, Brenda's yellow cryptantha, and galleta
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	5-15
Litter (<5 mm)	0-10
Rock fragments	30-45
Bare soil	40-55
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479036 meters E., 4234853 meters N., zone 12

A—0 to 3 inches (0 to 7 centimeters); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; 13 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots throughout;

Figure 268.—Profile of the Remorris soil in map unit 76 (Remorris sandy loam, 2 to 60 percent slopes). Bedrock is at a depth of 43 centimeters. Scale is in centimeters.

many very fine and many fine irregular pores; 5 percent channers; slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

Bw—3 to 8 inches (7 to 20 centimeters); yellowish red (5YR 5/6) sandy loam, yellowish red (5YR 4/6) moist; 15 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, common fine, and common medium roots throughout; many very fine and many fine irregular pores; 3 percent channers; slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C—8 to 17.5 inches (20 to 45 centimeters); reddish brown (2.5YR 5/4) sandy loam, reddish brown (2.5YR 4/4) moist; 16 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; many very fine and many fine irregular pores; 10 percent gravel; very slightly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Cr—17.5 to 27.5 inches (45 to 70 centimeters); weakly cemented, fractured sandstone and siltstone.

Range in Characteristics

A horizon:
Hue—2.5YR or 5YR
Texture—loam or sandy loam
Clay content—12 to 25 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—0 to 5 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 10 percent channers

Bw horizon:
Clay content—15 to 25 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—0 to 5 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 50 percent parachanners or paragravel and 0 to 5 percent channers

C or Cy horizon:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Texture—sandy loam, loam, or silt loam
Clay content—15 to 25 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—0 to 5 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—10 to 80 percent parachanners or paragravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Remorris soil differs from the Remorris series in that it averages 15 to 25 percent clay in the particle-size control section and contains up to 80 percent parachanners in the C horizon. The Remorris series averages 18 to 35 percent clay in the particle-size control section and has up to 35 percent gravel and channers.

77—Remorris, strongly alkaline-Rock outcrop complex, 30 to 70 percent slopes

Map Unit Setting

General setting: Escarpments in Cathedral Valley, Hartnet, and South Desert (fig. 269)
Major land resource area: 35—Colorado Plateau
Elevation: 4,960 to 7,790 feet (1,513 to 2,373 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Remorris, strongly alkaline and similar soils: 60 percent
Rock outcrop, Curtis, Summerville, and Entrada Formations: 30 percent
Minor components (10 percent) and their ecological sites:
Catahoula, saline soils on escarpments and talus slopes (moderately deep to very deep, loamy-skeletal soils); Desert Very Steep Stony Loam (Shadscale)

Figure 269.—An area of map unit 77 (Remorris, strongly alkaline-Rock outcrop complex, 30 to 70 percent slopes) on escarpments.

Description of the Remorris, Strongly Alkaline Soil

Note: A strongly alkaline phase and a desert ecological site are assigned to this ustic aridic soil because the soil's high pH and chemistry are restrictive to plant growth.

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 270)
Landform: Escarpments (fig. 271)
Geology: Summerville, Curtis, and Entrada Formations
Parent material: Residuum weathered from sandstone and siltstone
Slope: 30 to 70 percent, northeast to northwest aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 20 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Desert Clay (Castle Valley Saltbush)
Ecological site number: R035XY103UT

Present vegetation (in most areas): Valley saltbush, galleta, Bigelow sage, shadscale, Torrey's jointfir, and Indian ricegrass
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 272)

Plant canopy	30-40
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	2-10
Cyanobacteria crust	40-50
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 482678 meters E., 4249063 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); light reddish brown (5YR 6/4) very channery loam, yellowish red (5YR 4/6) moist; 23 percent clay; weak fine subangular blocky structure; moderately hard, firm, moderately sticky and moderately plastic; many very fine and common fine vesicular pores; 35 percent channers; strongly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Figure 270.—Profile of the Remorris, strongly alkaline soil in map unit 77 (Remorris, strongly alkaline-Rock outcrop complex, 30 to 70 percent slopes). Bedrock is at a depth of 17 centimeters. Scale is in centimeters.

Figure 271.—The Remorris, strongly alkaline soil in map unit 77 (Remorris, strongly alkaline-Rock outcrop complex, 30 to 70 percent slopes) on escarpments.

C—2 to 6.5 inches (5 to 17 centimeters); reddish brown (5YR 5/4) parachannery clay loam, reddish brown (5YR 4/4) moist; 30 percent clay; weak medium subangular blocky structure; moderately hard, firm, moderately sticky and moderately plastic; many very fine and many fine irregular pores; 30 percent parachanners; strongly effervescent; strongly alkaline, pH 8.8; clear smooth boundary.

Cr—6.5 to 16.5 inches (17 to 42 centimeters); weakly cemented, fractured siltstone and sandstone.

Range in Characteristics

A or surface C horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist

Texture—fine sandy loam, very fine sandy loam, loam, or silty clay loam
Clay content—15 to 35 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—0 to 2 percent
Sodium adsorption ratio—5 to 10
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 50 percent gravel, channers, paragravel, or parachanners
Reaction—strongly alkaline or very strongly alkaline (pH 8.5 to 11.0)

Subsurface C horizons:
Hue—5YR or 7.5YR
Value—5 or 6 dry
Texture—sandy loam, fine sandy loam, loam, clay loam, or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—5 to 20 percent
Gypsum content—0 to 2 percent
Sodium adsorption ratio—5 to 10
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—35 to 85 percent paragravel or parachanners
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Rock Outcrop, Curtis, Summerville, and Entrada Formations

This component is characterized by many cliffs and escarpments with very steep colluvial and talus slopes. The lithology is sandstone, siltstone, or shale and occurs in alternating bands of strongly cemented and weakly cemented material. The vertical relief of the cliffs ranges from a few feet to several tens of feet and is typically

Figure 272.—Typical surface of the Remorris, strongly alkaline soil in map unit 77 (Remorris, strongly alkaline-Rock outcrop complex, 30 to 70 percent slopes).

Figure 273.—Landscape of map unit 78 (Remorris-Milok-Rock outcrop complex, 10 to 60 percent slopes) in the foreground. This map unit is on hills and dip slopes of cuestas.

continuous. Rockfall and stones dominate the surface. Typically, the steepness, vertical relief, and continuity of cliffs make travel by full-sized four-wheeled vehicles virtually impossible. Travel by foot is extremely difficult and strenuous or nearly impossible and is usually hazardous. This component is usually a natural barrier to livestock and many other terrestrial animals. The area is typically barren but may have vegetation growing in cracks and crevices or in the colluvial and talus sediment covering the surface.

78—Remorris-Milok-Rock outcrop complex, 10 to 60 percent slopes

Map Unit Setting

General setting: Areas throughout the northern portion of Capitol Reef National Park (fig. 273)
Major land resource area: 35—Colorado Plateau
Elevation: 5,320 to 7,480 feet (1,622 to 2,280 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Remorris and similar soils: 40 percent
Milok, extremely stony and similar soils: 25 percent

Rock outcrop, Entrada and Summerville Formations: 15 percent
Minor components (20 percent) and their ecological sites:
- Badland on hills with no vegetation
- Strych soils on pediment remnants (very deep, loamy-skeletal soils with calcic horizons); Semidesert Stony Loam (Utah Juniper-Pinyon)
- Sandyranch soils on stream terraces and flood-plain steps (very deep, sandy soils); Sandy Bottom (Fourwing Saltbush)
- Lemrac soils on hills (moderately deep, loamy soils with gypsic horizons); Semidesert Shallow Gypsum (Mormontea)

Description of the Remorris Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 274)
Landform: Dip slopes of structural benches, hillslopes, and cuestas (fig. 275)

Figure 274.—Profile of the Remorris soil in map unit 78 (Remorris-Milok-Rock outcrop complex, 10 to 60 percent slopes). Soft bedrock is at a depth of 49 centimeters; hard bedrock is at a depth of 60 centimeters. Scale is in centimeters.

Figure 275.—The Remorris soil in map unit 78 (Remorris-Milok-Rock outcrop complex, 10 to 60 percent slopes) on hills and dip slopes of cuestas.

Geology: Entrada and Summerville Formations (Jurassic)
Parent material: Slope alluvium derived from sandstone and siltstone over residuum weathered from sandstone and siltstone
Slope: 15 to 60 percent, northwest to south aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 15 to 24 inches; lithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 1.3 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Shale (Utah Juniper-Pinyon)
Ecological site number: R035XY234UT
Present vegetation (in most areas): Utah juniper, galleta, Indian ricegrass, roundleaf buffaloberry, Douglas rabbitbrush, and crispleaf buckwheat
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 276)

Plant canopy	10-20
Litter (<5 mm)	2-5
Rock fragments	60-70
Bare soil	30-40

Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 471253 meters E., 4257670 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); reddish brown (5YR 5/4) channery loam, reddish brown (5YR 4/4) moist; 26 percent clay; weak very thick platy structure; slightly hard, friable, moderately sticky and moderately plastic; few fine and common very fine roots throughout; many very fine irregular pores; 20 percent channers; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C1—3.5 to 10.5 inches (9 to 27 centimeters); reddish brown (5YR 5/4) extremely paragravelly clay loam, reddish brown (5YR 4/4) moist; 29 percent clay; weak fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine, common fine, common medium, common coarse, and common very coarse roots throughout; many very fine irregular pores; 60 percent paragravel; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—10.5 to 19.5 inches (27 to 49 centimeters); reddish brown (5YR 5/4) extremely paragravelly loam, reddish brown (5YR 4/4) moist; 26 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; common fine and

Figure 276.—Surface of the Remorris soil in map unit 78 (Remorris-Milok-Rock outcrop complex, 10 to 60 percent slopes).

common medium roots throughout; common very fine irregular pores; 85 percent paragravel; strongly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

Cr—19.5 to 23.5 inches (49 to 60 centimeters); moderately cemented, fractured sandstone or siltstone.

R—23.5 to 33.5 inches (60 to 85 centimeters); alternating layers of very strongly cemented and moderately cemented, fractured sandstone and siltstone.

Range in Characteristics

A or surface C horizon:

Hue—5YR or 7.5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—3 to 6 dry; 4 or 6 moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—14 to 27 percent
Calcium carbonate equivalent—1 to 15 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 50 percent gravel, channers, paragravel, or parachanners

Subsurface C horizons:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 3 to 5 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, loam, or clay loam
Clay content—12 to 30 percent
Calcium carbonate equivalent—1 to 15 percent
Gypsum content—0 to 2 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 85 percent paragravel or parachanners

Description of the Milok, Extremely Stony Soil

Note: An extremely stony phase is assigned to this component because 10 to 20 percent of the soil surface is covered with stones.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustic Haplocalcids (fig. 277)
Landform: Dissected hillslopes and pediments (fig. 278)
Geology: Terrace gravel deposits (Quaternary)
Parent material: Alluvium derived from basalt and/or residuum weathered from sedimentary rock over slope alluvium derived from sandstone
Slope: 10 to 35 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 40 to 80 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 6.1 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 35 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)

Figure 277.—Profile of the Milok soil in map unit 78 (Remorris-Milok-Rock outcrop complex, 10 to 60 percent slopes). Scale is in centimeters.

Ecological site name: Semidesert Gravelly Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY206UT
Present vegetation (in most areas): Utah juniper, galleta, Indian ricegrass, Torrey's jointfir, needle and thread, and shadscale
Land capability classification (nonirrigated areas): 7e
Ground cover (percent): (fig. 279)

Plant canopy	25-35
Litter (<5 mm)	5-15
Rock fragments	40-60
Bare soil	5-15
Cyanobacteria crust	0

Figure 278.—The Milok soil in map unit 78 (Remorris-Milok-Rock outcrop complex, 10 to 60 percent slopes) on dip slopes of cuestas.

Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 471089 meters E., 4257793 meters N., zone 12

A—0 to 4.5 inches (0 to 11 centimeters); reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; 16 percent clay; weak fine subangular blocky structure parting to moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; common very fine, common fine, and common medium roots throughout; many very fine and common fine irregular pores; 5 percent gravel and 1 percent cobbles; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk—4.5 to 15 inches (11 to 38 centimeters); reddish brown (5YR 5/4) loam, yellowish red (5YR 4/6) moist; 18 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, common fine, and common medium roots throughout; many very fine and many fine irregular pores; common fine irregular carbonate masses in matrix; 5 percent gravel and 3 percent cobbles; violently effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

BCk—15 to 36 inches (38 to 92 centimeters); light reddish brown (5YR 6/4) very fine sandy loam, reddish brown (5YR 4/4) moist; 16 percent clay; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, few fine, few medium, and few coarse roots; common very fine

and common fine irregular pores; few fine irregular carbonate masses in matrix; 5 percent gravel and 5 percent paragravel; strongly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

C—36 to 44.5 inches (92 to 113 centimeters); light brown (7.5YR 6/4) fine sandy loam, strong brown (7.5YR 4/6) moist; 13 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; many very fine and many fine irregular pores; 10 percent gravel; strongly effervescent; strongly alkaline, pH 8.6; gradual wavy boundary.

Cr—44.5 to 54.5 inches (113 to 138 centimeters); weakly cemented sandstone or siltstone.

Range in Characteristics

Clay content in the particle-size control section: Average of less than 18 percent

Rock fragment content in the particle-size control section: Average of less than 35 percent

Note: Some pedons may have a Bw horizon above the Bk horizon

A horizon:

Hue—7.5YR or 5YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—3 or 4 dry; 3 to 6 moist
Texture—sandy loam, fine sandy loam, or loam
Clay content—8 to 20 percent
Calcium carbonate equivalent—5 to 30 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel

Figure 279.—Surface of the Milok soil in map unit 78 (Remorris-Milok-Rock outcrop complex, 10 to 60 percent slopes).

Bk or BCk horizon:
Hue—7.5YR or 5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 to 6 dry; 4 or 6 moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—10 to 22 percent
Calcium carbonate equivalent—5 to 35 percent
SAR—0 to 5
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C horizon:
Hue—7.5YR, 5YR, or 2.5YR
Value—4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—10 to 25 percent
Calcium carbonate equivalent—5 to 30 percent
SAR—0 to 5
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 50 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Milok soil differs from the Milok series in that it does not have a Bw horizon, has the upper boundary of the calcic horizon within a depth of 6 inches, has very fine sandy loam texture in the lower part of the Bk horizon, and in some pedons is deep to a paralithic contact. The Milok series has a Bw horizon, has the upper boundary of the calcic horizon at a depth of 6 to 20 inches, has sandy loam, fine sandy loam, and loam textures, and is very deep.

Description of the Rock Outcrop, Entrada and Summerville Formations

This component is characterized by gently sloping to steep rock outcrop. The lithology is sandstone. Typically, there are very few nearly vertical cliffs to impede vehicular travel. The vertical relief commonly ranges from a few feet to several feet. Due to the steepness of slopes, the area can be negotiated by full-sized four-wheeled vehicles with care. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

79—Remorris-Peachsprings complex, 5 to 60 percent slopes

Map Unit Setting

General setting: The Hartnet
Major land resource area: 35—Colorado Plateau
Elevation: 5,820 to 6,820 feet (1,774 to 2,080 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Remorris and similar soils: 50 percent

Peachsprings, strongly saline and similar soils: 20 percent
Minor components (30 percent) and their ecological sites:
- Strych family soils on pediment remnants (very deep, loamy-skeletal soils with calcic horizons); Semidesert Stony Loam (Utah Juniper-Pinyon)
- Rock outcrop (Curtis and Summerville Formation sandstones)
- Cannonville soils on hills (shallow, clayey soils); Semidesert Shallow Clay (Shadscale-Utah Juniper)
- Clapper soils on side slopes of hills and pediments (deep and very deep, loamy-skeletal soils with calcic horizons); Semidesert Very Steep Stony Loam (Salina Wildrye)

Description of the Remorris Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 280)
Landform: Escarpments (fig. 281)
Geology: Curtis and Summerville Formations (Jurassic)
Parent material: Colluvium derived from sandstone and shale over residuum weathered from sandstone and shale
Slope: 30 to 60 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 8 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 1.9 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Clay (Shadscale-Utah Juniper)
Ecological site number: R035XY239UT
Present vegetation (in most areas): Broom snakeweed, galleta, shadscale, needle and thread, and desert needlegrass
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-20
Rock fragments	0-5
Bare soil	35-50
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 480652 meters E., 4253643 meters N., zone 12

A—0 to 3 inches (0 to 7 centimeters); reddish yellow (5YR 6/6) gravelly loam, yellowish red (5YR 4/6) moist; 22 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine

Figure 280.—Profile of the Remorris soil in map unit 79 (Remorris-Peachsprings complex, 5 to 60 percent slopes). Soft bedrock is at a depth of 41 centimeters. Scale is in centimeters.

roots throughout; many very fine irregular pores; 15 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C1—3 to 9 inches (7 to 23 centimeters); reddish brown (5YR 5/4) very paragravelly clay loam, dark reddish brown (5YR 3/4) moist; 30 percent clay; weak fine subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine roots throughout; many very fine and many fine irregular pores; 45 percent paragravel; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—9 to 16 inches (23 to 41 centimeters); 10 percent light gray (5Y 7/2) and 90 percent reddish brown (5YR 5/4) very parachannery clay loam, 10 percent light olive gray (5Y 6/2) and 90 percent dark reddish brown (5YR 3/4) moist; 29 percent clay; massive; moderately hard, firm, moderately sticky and moderately plastic; common fine and few very fine roots throughout; many very fine and many fine

irregular pores; 55 percent parachanners; strongly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

Cr—16 to 26 inches (41 to 66 centimeters); weakly cemented, very fractured siltstone.

Range in Characteristics

A or surface C horizon:

Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam, loam, or clay loam
Clay content—18 to 32 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—0 to 2 percent
Sodium adsorption ratio—0 to 5
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 35 percent gravel, channers, paragravel, or parachanners
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Subsurface C horizons:

Hue—5YR or 5Y
Value—5 or 6 dry; 3 or 4 moist
Texture—loam, clay loam, or silty clay loam
Clay content—18 to 32 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—0 to 2 percent
Sodium adsorption ratio—0 to 5

Figure 281.—The Remorris soil in map unit 79 (Remorris-Peachsprings complex, 5 to 60 percent slopes) on escarpments.

Figure 282.—Profile of Peachsprings soil in map unit 79 (Remorris-Peachsprings complex, 5 to 60 percent slopes). Scale is in centimeters.

Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—15 to 60 percent paragravel or parachanners
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Peachsprings, Strongly Saline Soil

Note: A strongly saline phase and a desert ecological site are assigned to this ustic aridic soil because the high salinity in the substratum of the soil is restrictive to plant growth.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplocalcids (fig. 282)
Landform: Alluvial fans and pediments (fig. 283)
Geology: Curtis and Summerville Formations (Jurassic)
Parent material: Slope alluvium derived from sandstone and shale over residuum weathered from sandstone and shale
Slope: 5 to 15 percent, northeast to north aspects
Depth to restrictive feature(s): More than 60 inches

Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 6.7 (moderate)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: B
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 50 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Desert Alkali Sandy Loam (Alkali Sacaton)
Ecological site number: R035XY101UT
Present vegetation (in most areas): Alkali sacaton, Indian ricegrass, needle and thread, blue grama, and Salina wildrye
Land capability classification (nonirrigated areas): 6e
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	0-5
Rock fragments	15-25
Bare soil	30-40
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0

Figure 283.—The Peachsprings soil in map unit 79 (Remorris-Peachsprings complex, 5 to 60 percent slopes) on pediments.

Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 470422 meters E., 4258719 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; 12 percent clay; moderate very thick platy structure; soft, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many medium, many very fine, and many fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

Bk—3.5 to 12 inches (9 to 30 centimeters); pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; 15 percent clay; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine roots throughout; many very fine and many fine irregular pores; common very coarse irregular carbonate masses in matrix; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Cz1—12 to 45.5 inches (30 to 115 centimeters); light olive gray (5Y 6/2) loam, brown (7.5YR 5/4) and olive (5Y 5/3) moist; 25 percent clay; weak medium subangular blocky structure; slightly hard, friable, moderately sticky and very plastic; few fine and few medium roots throughout; common very fine and common fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Cz2—45.5 to 73 inches (115 to 185 centimeters); light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; 22 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; common very fine and common fine irregular pores; slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Hue—7.5YR or 10YR
Value—6 or 7 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—fine sandy loam, very fine sandy loam, or loam
Clay content—12 to 18 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—1 to 4 percent
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers

Bk, Bky, or By horizons:

Hue—10YR or 2.5Y
Value—6 or 7 dry; 4 or 5 moist
Chroma—2 to 4, dry or moist
Texture—sandy loam, loam, or sandy clay loam
Clay content—15 to 25 percent
Calcium carbonate equivalent—5 to 15 percent
Gypsum content—1 to 4 percent
SAR—0 to 5
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C or Cz horizons:

Hue—7.5YR, 10YR, 2.5YR, or 5Y
Value—6 or 7 dry; 4 or 5 moist

Figure 284.—Landscape of map unit 80 (Retsabal-Lemrac complex, 9 to 60 percent slopes). This map unit is in South Desert.

Chroma—2 or 3, dry or moist
Texture—very fine sandy loam, loam, or sandy clay loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—1 to 10 percent
Gypsum content—1 to 4 percent
SAR—10 to 20
Electrical conductivity—16 to 50 mmhos/cm
Rock fragments—0 to 15 percent gravel or channers
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Peachsprings soil differs from the Peachsprings series in that it is strongly saline in the substratum and formed in slope alluvium over sandstone residuum. The Peachsprings series is not strongly saline, has buried calcic horizons, and formed in mixed sedimentary, igneous, and metamorphic alluvium.

80—Retsabal-Lemrac complex, 9 to 60 percent slopes

Map Unit Setting

General setting: South Desert (fig. 284)
Major land resource area: 35—Colorado Plateau
Elevation: 6,200 to 7,020 feet (1,890 to 2,141 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Figure 285.—Profile of the Retsabal soil in map unit 80 (Retsabal-Lemrac complex, 9 to 60 percent slopes). Gypsum bedrock is at a depth of 24 centimeters. Scale is in centimeters.

Map Unit Composition

Retsabal and similar soils: 60 percent
Lemrac and similar soils: 20 percent
Minor components (20 percent) and their ecological sites:
Moderately deep, fine-silty soils with gypsic horizons on structural benches; Semidesert Gravelly Loam (Utah Juniper-Pinyon)

Description of the Retsabal Soil

Taxonomic classification: Fine-gypseous, hypergypsic, mesic Lithic Haplogypsids (fig. 285)
Landform: Dissected side slopes, homoclinal ridges, cuestas, and structural benches
Geology: Carmel Formation (Jurassic)
Parent material: Eolian deposits derived from sandstone and shale over residuum weathered from rock gypsum and/or residuum weathered from sandstone and shale
Slope: 9 to 60 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 6 to 16 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None

Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: D
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Gypsum (Mormontea)
Ecological site number: R035XY237UT
Present vegetation (in most areas): Torrey's jointfir, twoneedle pinyon, Bigelow sage, shadscale, green ephedra, and Indian ricegrass
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 286)

Plant canopy	10-25
Litter (<5 mm)	5-15
Rock fragments	5-10
Bare soil	15-25
Cyanobacteria crust	40-60
Lichen crust	0-5
Moss crust	0
Salt crust	0
Gypsum crust	0-10

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 469514 meters E., 4255267 meters N., zone 12

Figure 286.—Surface of the Retsabal soil in map unit 80 (Retsabal-Lemrac complex, 9 to 60 percent slopes).

A—0 to 1 inch (0 to 3 centimeters); very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; 16 percent clay; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine vesicular pores; carbonate, finely disseminated; strongly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Byy—1 to 6 inches (3 to 15 centimeters); white (10YR 8/1) paragravelly fine gypsum material, white (10YR 8/1) moist; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots throughout; common fine irregular pores; many gypsum crystals; 25 percent paragravel; noneffervescent; slightly alkaline, pH 7.4; clear wavy boundary.

R—6 to 15.5 inches (15 to 40 centimeters); strongly cemented gypsum.

Range in Characteristics

A horizon:

Hue—7.5YR or 10YR
Value—6 to 8 dry; 5 to 7 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—fine sand, fine sandy loam, loam, or silt loam
Clay content—2 to 17 percent
Calcium carbonate equivalent—0 to 4 percent
Gypsum content—5 to 90 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 40 percent paragravel or parachanners
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Byy horizon:

Hue—2.5Y, 7.5YR, or 10YR
Chroma—1 or 2, dry or moist
Texture—fine gypsum material
Clay content—3 to 17 percent
Calcium carbonate equivalent—0 to 4 percent
Gypsum content—50 to 90 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—10 to 25 percent paragravel or parachanners
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Retsabal soil is considered a taxadjunct to the Retsabal series because it has a lithic contact within a depth of 50 centimeters and is classified as a Lithic Haplogypsid. The Retsabal series is shallow to a paralithic contact and is classified as a Leptic Haplogypsid.

Description of the Lemrac Soil

Taxonomic classification: Fine-gypseous, hypergypsic, mesic Leptic Haplogypsids (fig. 287)
Landform: Dissected cuestas and structural benches
Geology: Carmel Formation (Jurassic)
Parent material: Slope alluvium derived from sandstone and shale over residuum weathered from rock gypsum
Slope: 15 to 60 percent, northwest to northeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 20 to 25 inches
Drainage class: Well drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 2.9 (low)
Shrink-swell potential: About 1.5 LEP (low)

Figure 287.—Profile fo the Lemrac soil in map unit 80 (Retsabal-Lemrac complex, 9 to 60 percent slopes). Bedrock is at a depth of 56 centimeters. Scale is in centimeters.

Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: B
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Gypsum (Mormontea)
Ecological site number: R035XY237UT

Present vegetation (in most areas): Torrey's jointfir, twoneedle pinyon, Bigelow sage, shadscale, green ephedra, and Indian ricegrass
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	10-25
Litter (<5 mm)	5-15
Rock fragments	5-10
Bare soil	15-25
Cyanobacteria crust	40-60
Lichen crust	0-5
Moss crust	0
Salt crust	0
Gypsum crust	0-10

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 470806 meters E., 4254309 meters N., zone 12

Byy1—0 to 4 inches (0 to 10 centimeters); very pale brown (10YR 7/3) fine gypsum material, pale brown (10YR 6/3) moist; massive; soft, very friable, nonsticky and nonplastic; many fine irregular gypsum crystals in matrix; strongly effervescent; slightly alkaline, pH 7.8; clear wavy boundary.

Byy2—4 to 14.5 inches (10 to 37 centimeters); very pale brown (10YR 7/3) fine gypsum material, pale brown (10YR 6/3) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many fine irregular gypsum crystals in matrix; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Byy3—14.5 to 22 inches (37 to 56 centimeters); very pale brown (10YR 7/3) fine gypsum material, pale brown (10YR 6/3) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; many fine irregular gypsum crystals in matrix; 10 percent gravel; strongly effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

R—22 to 32 inches (56 to 81 centimeters); strongly cemented gypsum.

Range in Characteristics

By1 horizon:
Value—7 or 8 dry; 5 to 8 moist
Chroma—1 to 4, dry or moist
Texture—fine gypsum material
Calcium carbonate equivalent—0 to 4 percent
Gypsum content—40 to 80 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

By2 and By3 horizons:
Value—7 or 8 dry; 6 moist
Chroma—2 or 3 dry; 3 or 4 moist
Texture—fine gypsum material
Calcium carbonate equivalent—0 to 4 percent
Gypsum content—40 to 80 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—10 to 25 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

81—Rizno-Mido, warm-Rock outcrop complex, 2 to 30 percent slopes

Map Unit Setting

General setting: Areas along Halls Creek
Major land resource area: 35—Colorado Plateau
Elevation: 4,580 to 5,100 feet (1,395 to 1,555 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 52 to 54 degrees F (11.1 to 12.2 degrees C)
Mean annual soil temperature: 54 to 56 degrees F (12.2 to 13.3 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Rizno and similar soils: 50 percent
Mido, warm and similar soils: 30 percent
Rock outcrop, Entrada Sandstone: 20 percent
Minor components (less than 1 percent) and their ecological sites:
- Moderately deep, sandy soils on structural benches; Semidesert Sandy Loam (Blackbrush)
- Mido soils on dunes on structural benches (very deep, sandy soils); Semidesert Sand (Fourwing Saltbush)

Description of the Rizno Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 288)
Landform: Structural benches (fig. 289)
Geology: Entrada Sandstone (Jurassic)
Parent material: Eolian deposits derived from sandstone and/or residuum weathered from sandstone
Slope: 2 to 30 percent, southwest to northeast aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 6 to 25 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.6 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: D
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sandy Loam (Blackbrush)
Ecological site number: R035XY233UT
Present vegetation (in most areas): Blackbrush, Indian ricegrass, and galleta
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-35
Litter (<5 mm)	5-10
Rock fragments	0
Bare soil	20-30
Cyanobacteria crust	30-40

Figure 288.—Profile of the Rizno soil in map unit 81 (Rizno-Mido, warm-Rock outcrop complex, 2 to 30 percent slopes). Bedrock is at a depth of 20 centimeters. Scale is in centimeters.

Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 502580 meters E., 4184971 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 4 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine roots throughout; common very fine irregular pores; slightly effervescent; moderately alkaline, pH 7.9; abrupt wavy boundary.

C1—3.5 to 8 inches (9 to 20 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 7.9; clear wavy boundary.

2C2—8 to 15.5 inches (20 to 40 centimeters); reddish brown (2.5YR 5/4) fine sandy loam, reddish brown (2.5YR 4/4) moist; 11 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common very fine roots throughout; common very fine irregular pores; 5 percent channers; strongly effervescent; moderately alkaline, pH 7.9; abrupt wavy boundary.

2R—15.5 to 25.5 inches (40 to 65 centimeters); indurated sandstone.

Range in Characteristics

A horizon:

Hue—5YR or 7.5YR
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—4 to 7 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

C1 horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—4 to 7 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

2C2 horizon:

Hue—2.5YR, 5YR, or 7.5YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—4 or 6, dry or moist
Clay content—10 to 16 percent

Figure 289.—The Rizno soil in map unit 81 (Rizno-Mido, warm-Rock outcrop complex, 2 to 30 percent slopes).

Figure 290.—Profile of the Mido, warm soil in map unit 81 (Rizno-Mido, warm-Rock outcrop complex, 2 to 30 percent slopes). Scale is in centimeters.

Calcium carbonate equivalent—2 to 4 percent
Electrical conductivity—2 to 4 mmhos/cm
Rock fragments—0 to 40 percent paragravel or parachanners
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Mido, Warm Soil

Note: A warm phase is assigned to this soil to account for the blackbrush ecological site.

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 290)
Landform: Structural benches (fig. 291)

Geology: Quaternary eolian deposits
Parent material: Eolian deposits derived from sandstone
Slope: 6 to 30 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: More than 20 in/hr (very rapid)
Available water capacity (total inches): About 4.3 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sand (Blackbrush)
Ecological site number: R035XY210UT
Present vegetation (in most areas): Blackbrush, Indian ricegrass, sand sagebrush, galleta, and rosemary mint
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-30
Litter (<5 mm)	5-10

Figure 291.—The Mido warm soil in map unit 81 (Rizno-Mido, warm-Rock outcrop complex, 2 to 30 percent slopes) on structural benches.

Rock fragments	0
Bare soil	25-55
Cyanobacteria crust	10-40
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 503096 meters E., 4184579 meters N., zone 12

C1—0 to 5 inches (0 to 13 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; common fine roots throughout; noneffervescent; slightly alkaline, pH 7.8; clear wavy boundary.

C2—5 to 21 inches (13 to 53 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 2 percent clay; single grain; loose, nonsticky and nonplastic; common fine roots throughout; noneffervescent; moderately alkaline, pH 8.0; gradual wavy boundary.

C3—21 to 71 inches (53 to 180 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 3 percent clay; single grain; loose, nonsticky and nonplastic; common fine and common medium roots throughout; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A or C1 horizon:

Value—5 dry; 4 moist
Chroma—6 dry or moist
Texture—fine sand or loamy fine sand
Clay content—2 to 7 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

C2 horizon:

Value—5 dry; 4 moist
Chroma—6 dry or moist
Texture—fine sand or loamy fine sand
Clay content—2 to 8 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C3 horizon:

Value—5 dry; 4 moist
Chroma—4 or 6, dry or moist
Clay content—3 to 8 percent
Calcium carbonate equivalent—2 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Rock Outcrop, Entrada Sandstone

This component is characterized by nearly level to strongly sloping rock outcrop with discontinuous cliffs and escarpments. The lithology is sandstone. The vertical relief is commonly a few feet, and the continuity of the cliffs is broken. Typically, there are enough cliffs to impede vehicular travel to some degree. The area can be negotiated by full-sized four-wheeled vehicles with difficulty. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

82—Rizno-Rock outcrop complex, 1 to 25 percent slopes

Map Unit Setting

General setting: Mesa adjacent to Glen Canyon National Recreation Area, areas above Circle Cliffs, and areas southeast of Red Slide
Major land resource area: 35—Colorado Plateau
Elevation: 4,430 to 7,040 feet (1,350 to 2,147 meters)
Mean annual precipitation: 10 to 14 inches (250 to 350 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.0 to 13.0 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.1 to 14.1 degrees C)
Frost-free period: 135 to 165 days

Map Unit Composition

Rizno and similar soils: 60 percent
Rock outcrop: 20 percent
Minor components (20 percent):
- Anasazi soils on mesas and structural benches (moderately deep, coarse-loamy soils with calcic horizons) (semidesert, mesic)
- Mido soils on dunes on cuestas and structural benches (very deep, sandy soils) (semidesert, mesic)

Description of the Rizno Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Interfluves on hills, mesas, and structural benches
Geology: Kayenta Formation sandstone (Jurassic)
Parent material: Residuum weathered from sandstone
Slope: 1 to 25 percent, north to northwest aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 10 inches; lithic bedrock at a depth of 5 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.3 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 0 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sandy Loam (Utah Juniper, Blackbrush)

Ecological site number: R035XY236UT
Present vegetation (in most areas): Blackbrush, Utah juniper, twoneedle pinyon, broom snakeweed, green Mormon tea, and plains pricklypear
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	20
Litter (<5 mm)	3
Rock fragments	50
Bare soil	7
Cyanobacteria crust	12
Lichen crust	6
Moss crust	7
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 601921 meters E., 4260803 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); yellowish red (5YR 5/6) gravelly sandy loam, yellowish red (5YR 4/6) moist; 10 percent clay; weak fine subangular blocky and weak medium granular structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; common fine irregular pores; 25 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bw—2 to 4 inches (5 to 10 centimeters); reddish yellow (5YR 6/6) channery sandy loam, yellowish red (5YR 4/6) moist; 16 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; common fine irregular pores; carbonate, finely disseminated throughout; 15 percent channers; violently effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Cr—4 to 5.5 inches (10 to 14 centimeters); weathered, fractured sandstone; very abrupt wavy boundary.

R—5.5 to 15.5 inches (14 to 39 centimeters); unweathered, unfractured sandstone.

Range in Characteristics

Reaction: pH 7.9 to 8.4 (moderately alkaline)

A horizon:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, moist or dry

Bw or C horizon:
Hue—2.5YR or 5YR
Value—4 to 6 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Clay content—10 to 18 percent
Calcium carbonate equivalent—10 to 25 percent
Rock fragments—10 to 30 percent gravel

Description of the Rock Outcrop

This component consists of interbedded sandstone and shale bedrock that is typically exposed along ledges and slick rock areas (Kayenta or Morrison Formation). It also includes areas where the depth to bedrock is less than 4 inches (10 centimeters).

Figure 292.—Landscape of map unit 83 (Rizno-Rock outcrop complex, 15 to 35 percent slopes). This map unit is on dip slopes of cuestas.

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

Map Unit Setting

General setting: Strike Valley (fig. 292)
Major land resource area: 35—Colorado Plateau
Elevation: 4,920 to 5,380 feet (1,500 to 1,641 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 52 to 54 degrees F (11.1 to 12.2 degrees C)
Mean annual soil temperature: 54 to 56 degrees F (12.2 to 13.3 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Rizno, warm and similar soils: 60 percent
Rock outcrop, Dakota Formation sandstone: 20 percent
Minor components (20 percent) and their ecological sites:
Very deep coarse-loamy soils in depressions on hogbacks; Semidesert Sandy Loam (Blackbrush)

Description of the Rizno, Warm Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 293)
Landform: Dip slopes of cuestas
Geology: Dakota Formation (Cretaceous)

Figure 293.—Profile of the Rizno soil in map unit 83 (Rizno-Rock outcrop complex, 15 to 35 percent slopes). Bedrock is at a depth of 26 centimeters. Scale is in centimeters.

Parent material: Colluvium derived from sandstone and/or slope alluvium derived from sandstone
Slope: 15 to 35 percent, north to east aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 2 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.4 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None

Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sandy Loam (Utah Juniper, Blackbrush)
Ecological site number: R035XY236UT
Present vegetation (in most areas): Blackbrush, twoneedle pinyon, Utah juniper, littleleaf mountain mahogany, and Salina wildrye
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-30
Litter (<5 mm)	2-5
Rock fragments	50-60
Bare soil	5-15
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 502425 meters E., 4187002 meters N., zone 12

A—0 to 2.5 inches (0 to 6 centimeters); pale brown (10YR 6/3) gravelly fine sandy loam, brown (10YR 5/3) moist; 10 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots throughout; many very fine irregular pores; common coarse irregular carbonate masses on bottom of rock fragments; 25 percent gravel; slightly effervescent; slightly alkaline, pH 7.8; abrupt wavy boundary.

C—2.5 to 10 inches (6 to 26 centimeters); pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; 17 percent clay; weak very thin platy structure; slightly hard, friable, slightly sticky and moderately plastic; common fine and common medium roots throughout; many very fine and many fine irregular pores; carbonate, finely disseminated throughout; 7 percent channers; strongly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

R—10 to 20 inches (26 to 51 centimeters); indurated sandstone; common fine and common medium roots at top of horizon.

Range in Characteristics

A horizon:
Value—5 or 6 dry; 4 or 5 moist
Chroma—2 or 3, dry or moist
Texture—fine sandy loam or sandy loam
Clay content—7 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—5 to 35 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon:
Value—5 or 6, dry or moist
Chroma—2 or 3, dry or moist

Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—5 to 35 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

This Rizno soil differs from the Rizno series in that it has hue of 7.5YR and 10YR whereas the Rizno series typically has hue of 5YR and 2.5YR.

Description of the Rock Outcrop, Dakota Formation Sandstone

This component is characterized by gently sloping to steep rock outcrop. The lithology is sandstone. The vertical relief commonly ranges from a few feet to several feet. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

84—Rock outcrop-Arches complex, 2 to 60 percent slopes

Map Unit Setting

General setting: Sites adjacent to Glen Canyon National Recreation Area at the top of the Waterpocket Fold
Major land resource area: 35—Colorado Plateau
Elevation: 4,210 to 6,970 feet (1,282 to 2,125 meters)
Mean annual precipitation: 10 to 14 inches (250 to 350 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.0 to 13.0 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.1 to 14.1 degrees C)
Frost-free period: 135 to 165 days

Map Unit Composition

Rock outcrop: 60 percent
Arches and similar soils: 30 percent
Minor components (10 percent):
Shallow to deep, sandy-skeletal soils on talus slopes and structural benches (semidesert, mesic)
Moderately deep, sandy soils on coppice mounds and sand sheets on mesas and structural benches (semidesert, mesic)

Description of the Rock Outcrop

This component consists of sandstone bedrock that is typically exposed along ledges and slick rock areas (Navajo or Cedar Mesa Sandstone). It also includes areas where the depth to bedrock is less than 4 inches (10 centimeters).

Description of the Arches Soil

Taxonomic classification: Mixed, mesic Lithic Torripsamments
Landform: Sand sheets on interfluves on hills, mesas, and structural benches
Geology: Navajo and Wingate Sandstones (Jurassic)
Parent material: Eolian sands and/or residuum weathered from sandstone
Slope: 2 to 60 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 11 inches
Drainage class: Excessively drained

Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 0.7 (very low)
Shrink-swell potential: About 1.0 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 2 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Sand (Utah Juniper-Pinyon)
Ecological site number: R035XY227UT
Present vegetation (in most areas): Mesa dropseed, Utah juniper, Cutler Mormon tea, and crispleaf buckwheat
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	3
Litter (<5 mm)	5
Rock fragments	16
Bare soil	17
Cyanobacteria crust	4
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 482170 meters E., 4160488 meters N., zone 12

C1—0 to 1 inch (0 to 3 centimeters); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4) moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; many fine and many very fine roots throughout; common fine tubular pores; 5 percent fine gravel; very slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear smooth boundary.
C2—1 to 11 inches (3 to 28 centimeters); yellowish red (5YR 5/6) fine sand, reddish brown (5YR 4/4) moist; 5 percent clay; massive; loose, nonsticky and nonplastic; many fine and many very fine roots throughout; common fine tubular pores; 2 percent fine gravel; noneffervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; abrupt wavy boundary.
R—11 to 21 inches (28 to 53 centimeters); unweathered, unfractured sandstone.

Range in Characteristics

Reaction: pH 7.4 to 7.8 (slightly alkaline)

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

Figure 294.—Landscape of map unit 85 (Rock outcrop-Arches complex, 4 to 25 percent slopes).

85—Rock outcrop-Arches complex, 4 to 25 percent slopes

Map Unit Setting

General setting: Top of the Waterpocket Fold, Capitol Reef National Park (fig. 294)
Major land resource area: 35—Colorado Plateau
Elevation: 5,260 to 7,610 feet (1,604 to 2,320 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Rock outcrop, Kayenta and Navajo Sandstones: 40 percent
Arches and similar soils: 30 percent
Minor components (30 percent) and their ecological sites:
- Reef soils on cuestas (shallow, loamy-skeletal soils); Semidesert Shallow Loam (Utah Juniper-Pinyon)
- Deep to very deep, sandy-skeletal soils on talus slopes; Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)
- Mido soils on dunes and sand sheets on structural benches (very deep, sandy soils); Semidesert Sand (Fourwing Saltbush)

Description of the Rock outcrop, Kayenta and Navajo Sandstones

This component is characterized by gently sloping to steep rock outcrop with discontinuous cliffs and escarpments. The lithology is sandstone. The vertical relief

ranges from a few feet to several tens of feet, and the continuity of cliffs is broken. Typically, the area is steep enough and there are enough cliffs to make travel by full-sized four-wheeled vehicles very difficult. Travel by a small ATV or motorcycle is usually possible though difficult. The impediment to foot travel or to animals is usually only slight to moderate. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

Description of the Arches Soil

Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 295)
Landform: Structural benches

Figure 295.—Profile of the Arches soil in map unit 85 (Rock outcrop-Arches complex, 4 to 25 percent slopes). Hard sandstone bedrock is at a depth of 30 centimeters. Scale is in centimeters.

Figure 296.—Typical surface of the Arches soil in map unit 85 (Rock outcrop-Arches complex, 4 to 25 percent slopes).

Geology: Kayenta Formation and Navajo Sandstone (Jurassic)
Parent material: Eolian deposits derived from sandstone over residuum weathered from sandstone
Slope: 4 to 25 percent, east to west aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 1.1 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sand (Utah Juniper-Pinyon)
Ecological site number: R035XY227UT
Present vegetation (in most areas): Utah juniper, Bigelow sage, twoneedle pinyon, crispleaf buckwheat, and galleta
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 296)

Plant canopy	15-25
Litter (<5 mm)	10-15
Rock fragments	20-30

Bare soil	30-45
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479713 meters E., 4238153 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); light brown (7.5YR 6/4) loamy fine sand, strong brown (7.5YR 4/6) moist; 6 percent clay; weak very thick platy structure; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; many very fine and many fine irregular pores; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C—4 to 12 inches (10 to 30 centimeters); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; 5 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; few very fine, few fine, and few medium roots throughout; many very fine irregular pores; 5 percent channers; very slightly effervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

R—12 to 21.5 inches (30 to 55 centimeters); indurated, unfractured sandstone; few very fine, few fine, common medium, common coarse, and common very coarse roots at top of horizon.

Range in Characteristics

A horizon:

Hue—5YR, 7.5YR, or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—2 to 6 percent
Calcium carbonate equivalent—0 to 3
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon:

Hue—5YR, 7.5YR, or 10YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—2 to 8 percent
Calcium carbonate equivalent—0 to 3
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent paragravel or parachanners
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

86—Rock outcrop-Daklos-Moclom complex, 5 to 20 percent slopes

Map Unit Setting

General setting: The Hartnet, Capitol Reef National Park
Major land resource area: 35—Colorado Plateau

Elevation: 5,030 to 7,180 feet (1,532 to 2,188 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Rock outcrop, Morrison Formation, Salt Wash Member: 35 percent
Daklos and similar soils: 25 percent
Moclom and similar soils: 20 percent
Minor components (20 percent) and their ecological sites:
- Rizno soils on dissected cuestas and pediments (shallow, loamy soils); Semidesert Shallow Loam (Utah Juniper-Pinyon)
- Badland with no vegetation
- Begay, saline soils on stream terraces and washes (very deep, coarse-loamy soils); Semidesert Loam (Shadscale)
- Moderately deep, coarse-loamy soils with calcic horizons on dip slopes of cuestas; Semidesert Gravelly Loam (Utah Juniper-Pinyon)
- Shallow, sandy soils on dissected cuestas and pediments; Shallow Sand Rock Pocket (Utah Juniper/Two-Needle Pinyon)

Description of the Rock Outcrop, Morrison Formation, Salt Wash Member

This component is characterized by nearly level to strongly sloping rock outcrop with discontinuous cliffs and escarpments. The lithology is conglomerate. The vertical relief is commonly a few feet, and the continuity of the cliffs is broken. Typically, there are enough cliffs to impede vehicular travel to some degree. The area can be negotiated by full-sized four-wheeled vehicles with difficulty. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

Description of the Daklos Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents (fig. 297)
Landform: Dip slopes of cuestas and mesas (fig. 298)
Geology: Morrison Formation (Jurassic), Salt Wash Member
Parent material: Residuum weathered from conglomerate and/or residuum weathered from sandstone
Slope: 5 to 20 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 5 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.7 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT

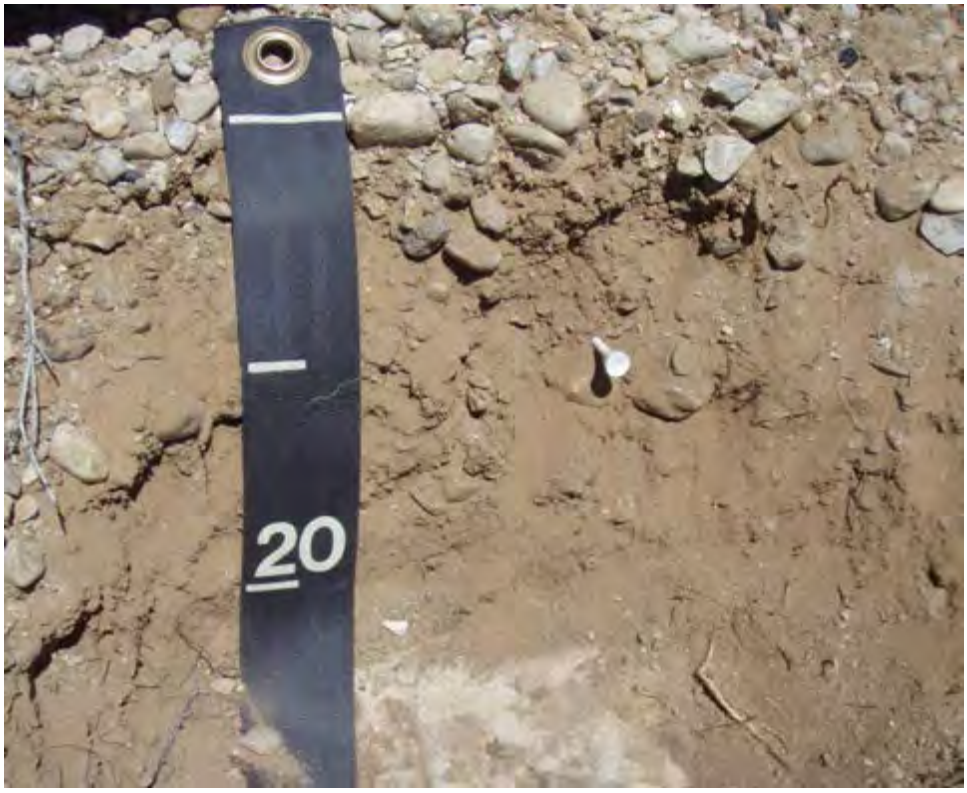

Figure 297.—Profile of the Daklos soil in map unit 86 (Rock outcrop-Daklos-Moclom complex, 5 to 20 percent slopes). Scale is in centimeters.

Figure 298.—The Daklos soil and Rock outcrop in map unit 86 (Rock outcrop-Daklos-Moclom complex, 5 to 20 percent slopes) on a dissected cuesta.

Figure 299.—Typical surface of the Daklos soil in map unit 86 (Rock outcrop-Daklos-Moclom complex, 5 to 20 percent slopes).

Present vegetation (in most areas): Galleta, Utah juniper, roundleaf buffaloberry, Bigelow sage, broom snakeweed, green ephedra, and twoneedle pinyon

Land capability classification (nonirrigated areas): 7s

Ground cover (percent): (fig. 299)

Plant canopy	20-25
Litter (<5 mm)	5-15
Rock fragments	55-65
Bare soil	5-15
Cyanobacteria crust	0-2
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 476675 meters E., 4257744 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); light yellowish brown (10YR 6/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; 10 percent clay; weak very thick platy structure; soft, very friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine irregular pores; 50 percent gravel; slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C—4 to 8.5 inches (10 to 22 centimeters); yellowish brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; 11 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic;

common very fine roots at top of horizon and few very fine roots throughout; many very fine irregular pores; 30 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

R—8.5 to 18.5 inches (22 to 47 centimeters); indurated conglomerate.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

A horizon:
Hue—10YR or 2.5Y
Value—6 to 8 dry; 4 to 6 moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 50 percent gravel or channers

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 dry; 4 to 6 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, loamy sand, or loamy coarse sand
Clay content—4 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—30 to 75 percent gravel or channers

Description of the Moclom Soil

Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 300)
Landform: Pediments (fig. 301)
Geology: Morrison Formation (Jurassic), Salt Wash Member
Parent material: Residuum weathered from conglomerate and/or sandstone
Slope: 5 to 20 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 0.2 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sand (Utah Juniper-Pinyon)
Ecological site number: R035XY227UT
Present vegetation (in most areas): Galleta, Utah juniper, roundleaf buffaloberry, Bigelow sage, broom snakeweed, green ephedra, and twoneedle pinyon
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 302)

Plant canopy	15-20
Litter (<5 mm)	5-15

Figure 300.—Profile of the Moclom soil in map unit 86 (Rock outcrop-Daklos-Moclom complex, 5 to 20 percent slopes). Bedrock is at a depth of 11 centimeters. Scale is in centimeters.

Figure 301.—The Moclom soil in map unit 86 (Rock outcrop-Daklos-Moclom complex, 5 to 20 percent slopes) on dissected pediments.

Figure 302.—Typical surface of the Moclom soil in map unit 86 (Rock outcrop-Daklos-Moclom complex, 5 to 20 percent slopes).

Rock fragments	55-65
Bare soil	10-20
Cyanobacteria crust	0-2
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 485123 meters E., 4244565 meters N., zone 12

AC—0 to 1.5 inches (0 to 4 centimeters); light yellowish brown (10YR 6/4) gravelly sand, yellowish brown (10YR 5/4) moist; 3 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine interstitial pores; slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C—1.5 to 4.5 inches (4 to 11 centimeters); light gray (10YR 7/2) gravelly sand, light brownish gray (10YR 6/2) moist; 1 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine interstitial pores; noneffervescent; slightly alkaline, pH 7.6; abrupt smooth boundary.

R—4.5 to 14 inches (11 to 36 centimeters); indurated conglomerate.

Range in Characteristics

A horizon:

Value—6 or 7 dry; 5 or 6 moist

Figure 303.—Landscape of map unit 87 (Rock outcrop-Myton-Somorent complex, 35 to 60 percent slopes). This map unit is on west-facing escarpments.

Chroma—3 or 4, dry or moist
Texture—sand, fine sand, or loamy fine sand
Clay content—2 to 8 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or channers

C horizon:
Hue—10YR or 2.5Y
Value—6 or 7 dry; 5 or 6 moist
Chroma—2 to 4, dry or moist
Texture—sand, fine sand, loamy sand, or loamy fine sand
Clay content—1 to 7 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel or channers

87—Rock outcrop-Myton-Somorent complex, 35 to 60 percent slopes

Map Unit Setting

General setting: Halls Creek area and west-facing escarpments (fig. 303)
Major land resource area: 35—Colorado Plateau
Elevation: 3,920 to 5,500 feet (1,195 to 1,676 meters)

Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Rock outcrop, Entrada Formation and Salt Wash Member of the Morrison Formation sandstones: 50 percent
Myton and similar soils: 25 percent
Somorent and similar soils: 25 percent
Minor components (less than 1 percent) and their ecological sites:
- Rubbleland with no vegetation
- Needle soils on structural benches (shallow, sandy soils); Desert Shallow Sandy Loam (Blackbrush)
- Moffat soils on hills (very deep, coarse-loamy soils with calcic horizons); Desert Sandy Loam (Blackbrush)
- Seeg soils on strath terraces (very deep, loamy-skeletal soils with calcic horizons); Desert Stony Loam (Blackbrush)

Description of the Rock Outcrop, Entrada Formation and Salt Wash Member of the Morrison Formation Sandstones

This component is characterized by very tall, nearly continuous, nearly vertical cliffs and escarpments. The lithology is sandstone. The vertical relief ranges from several tens to several hundreds of feet. Travel by any type of wheeled vehicle is virtually impossible. Travel by foot is extremely difficult or nearly impossible and is usually hazardous. This component is a natural barrier to livestock and most other terrestrial animals. The nearly vertical areas are barren but there may be vegetation growing in cracks and crevices or in areas of colluvial deposition.

Description of the Myton Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Typic Haplocambids (fig. 304)
Landform: Escarpments
Geology: Morrison Formation (Jurassic), Salt Wash Member
Parent material: Colluvium derived from sandstone
Slope: 35 to 60 percent, south to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 5.0 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Desert Very Steep Stony Loam (Shadscale)
Ecological site number: R035XY146UT
Present vegetation (in most areas): Shadscale, galleta, Indian ricegrass, mesa dropseed, Bigelow sage, and Torrey's jointfir
Land capability classification (nonirrigated areas): 7e

Figure 304.—Profile of the Myton soil in map unit 87 (Rock outcrop-Myton-Somorent complex, 35 to 60 percent slopes). Scale is in centimeters.

Ground cover (percent):

Plant canopy	10-20
Litter (<5 mm)	5-15
Rock fragments	40-60
Bare soil	20-30
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 509971 meters E., 4165349 meters N., zone 12

A—0 to 4.5 inches (0 to 12 centimeters); brown (7.5YR 5/4) very gravelly fine sandy loam, brown (7.5YR 4/4) moist; 12 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; common very fine irregular pores; 35 percent gravel, 5 percent cobbles, and 5 percent stones; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bw—4.5 to 23.5 inches (12 to 60 centimeters); yellowish red (5YR 5/6) very stony fine sandy loam, yellowish red (5YR 4/6) moist; 13 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; few fine and few medium roots throughout; many very fine irregular pores; 20 percent gravel, 15 percent cobbles, and 15 percent stones; strongly effervescent; strongly alkaline, pH 8.6; clear irregular boundary.

C—23.5 to 71 inches (60 to 180 centimeters); yellowish red (5YR 5/6) very stony fine sandy loam, yellowish red (5YR 4/6) moist; 13 percent clay; massive; moderately hard, firm, slightly sticky and nonplastic; few fine and few medium roots throughout; many very fine irregular pores; 20 percent gravel, 15 percent cobbles, and 15 percent stones; strongly effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

A horizon:

Hue—5YR, 7.5YR, or 10YR
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, sandy loam, or loamy fine sand
Clay content—8 to 15 percent
Calcium carbonate equivalent—2 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—20 to 55 percent gravel, cobbles, and stones

Bw horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, sandy loam, or loamy fine sand
Clay content—8 to 15 percent
Calcium carbonate equivalent—2 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 60 percent gravel, cobbles, and stones
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, sandy loam, or loamy fine sand
Clay content—8 to 15 percent
Calcium carbonate equivalent—2 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 60 percent gravel, cobbles, and stones
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Figure 305.—Profile of the Somorent soil in map unit 87 (Rock outcrop-Myton-Somorent complex, 35 to 60 percent slopes). Soft bedrock is at a depth of 32 centimeters. Scale is in centimeters.

This Myton soil is mapped as a taxadjunct to the Myton series because it contains a cambic horizon and is classified as a Typic Haplocambid whereas the Myton series lacks a cambic horizon and is classified as a Typic Torriorthent.

Description of the Somorent Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Typic Torriorthents (fig. 305)
Landform: Escarpments (fig. 306)
Geology: Summerville Formation (Jurassic)
Parent material: Slope alluvium derived from shale and siltstone over residuum weathered from shale and siltstone
Slope: 35 to 60 percent, south to northwest aspects

Depth to restrictive feature(s): Paralithic bedrock at a depth of 6 to 24 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 2.4 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Very Steep Stony Loam (Shadscale)
Ecological site number: R035XY146UT
Present vegetation (in most areas): Shadscale, galleta, Indian ricegrass, mesa dropseed, Bigelow sage, and Torrey's jointfir
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	10-20
Litter (<5 mm)	5-15
Rock fragments	40-60
Bare soil	20-30
Cyanobacteria crust	0
Lichen crust	0

Figure 306.—The Somorent soil in map unit 87 (Rock outcrop-Myton-Somorent complex, 35 to 60 percent slopes) on escarpments.

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 502455 meters E., 4186465 meters N., zone 12

AC—0 to 2 inches (0 to 5 centimeters); yellowish red (5YR 5/6) silt loam, yellowish red (5YR 4/6) moist; 20 percent clay; weak very thin platy structure parting to weak very fine granular; soft, very friable, slightly sticky and moderately plastic; common very fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout; 12 percent gravel; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; clear wavy boundary.

C1—2 to 6 inches (5 to 15 centimeters); reddish brown (5YR 5/3) silty clay loam, reddish brown (5YR 4/4) moist; 31 percent clay; moderate very fine angular blocky structure; hard, firm, slightly sticky and very plastic; common very fine roots throughout; common very fine irregular pores; carbonate, finely disseminated throughout; 1 percent gravel; strongly effervescent, by HCl, 1 normal; strongly alkaline, pH 8.6; gradual wavy boundary.

C2—6 to 12.5 inches (15 to 32 centimeters); pinkish gray (7.5YR 6/2) silty clay loam, brown (7.5YR 5/3) moist; 29 percent clay; moderate fine angular blocky structure; hard, firm, slightly sticky and very plastic; common very fine roots throughout; common very fine irregular pores; carbonate that is finely disseminated throughout and common fine gypsum masses around rock fragments; strongly effervescent, by HCl, 1 normal; strongly alkaline, pH 9.0; gradual wavy boundary.

Cr—12.5 to 17.5 inches (32 to 44 centimeters); weakly cemented, weathered, fractured shale.

Range in Characteristics

Note: Some pedons have silty slope alluvium overlying sandy residuum

A or AC horizon:

Hue—2.5YR or 5YR
Value—4 or 5, dry or moist
Chroma—4 or 6, dry or moist
Texture—silt loam or silty clay loam
Clay content—20 to 30 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C1 horizon:

Hue—2.5YR or 5YR
Value—3 to 6 dry; 3 to 5 moist
Chroma—3 to 6, dry or moist
Clay content—25 to 35 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C2 or Cy horizon:

Hue—5YR or 7.5YR
Value—5 or 6, dry or moist

Figure 307.—Landscape of map unit 88 (Rock outcrop-Nalcase complex, 2 to 30 percent slopes). This map unit is on Navajo Sandstone in the Waterpocket Fold.

Chroma—2 to 4, dry or moist
Clay content—25 to 35 percent
Calcium carbonate equivalent—0 to 10 percent
Gypsum content—0 to 10 percent
SAR—0 to 5
Electrical conductivity—2 to 4 mmhos/cm
Rock fragments—none

This Somorent soil differs from the Somorent series in that it has hue of 5YR and 2.5YR and has more than 18 percent clay in the particle-size control section whereas the Somorent series has hue of 7.5YR and 10YR and has less than 18 percent clay in the particle-size control section.

88—Rock outcrop-Nalcase complex, 2 to 30 percent slopes

Map Unit Setting

General setting: The Waterpocket Fold, Capitol Reef National Park (fig. 307)
Major land resource area: 35—Colorado Plateau
Elevation: 3,920 to 7,290 feet (1,194 to 2,222 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Rock outcrop, Navajo Sandstone: 60 percent
Nalcase and similar soils: 25 percent
Minor components (15 percent) and their ecological sites:
- Shallow, sandy soils with mixed mineralogy on structural benches; Shallow Sand Rock Pocket (Utah Juniper/Two-Needle Pinyon)
- Santrick soils on dunes and sand sheets on cuestas (moderately deep and deep, sandy soils); Shallow Sand Rock Pocket (Utah Juniper/Two-Needle Pinyon)
- Deep and very deep, sandy-skeletal soils on talus slopes; Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)

Description of the Rock outcrop, Navajo Sandstone

This component is characterized by many cliffs and escarpments with very steep colluvial and talus slopes. The lithology is Navajo Sandstone (Jurassic). The vertical relief of the cliffs ranges from a few feet to several tens of feet and is nearly continuous. Typically, the steepness, vertical relief, and continuity of cliffs make travel by full-sized four-wheeled vehicles nearly impossible. Travel by foot is difficult and strenuous. This component is usually a natural barrier to livestock and many other terrestrial animals. The area is typically barren but may have vegetation growing in cracks and crevices, in the colluvial and talus sediment covering the surface, or in pockets of eolian deposits, sand sheets, or coppice dunes.

Description of the Nalcase Soil

Taxonomic classification: Siliceous, mesic Lithic Torripsamments (fig. 308)
Landform: Coppice mounds on cuestas or hogbacks and dunes
Geology: Navajo Sandstone (Jurassic)
Parent material: Eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 2 to 30 percent, north to south aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 0.5 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 2 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Two-Needle Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): Littleleaf mountain mahogany, Utah serviceberry, greenleaf manzanita, singleleaf ash, twoneedle pinyon, Utah juniper, and Indian ricegrass
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	15-25
Litter (<5 mm)	15-25
Rock fragments	5-25

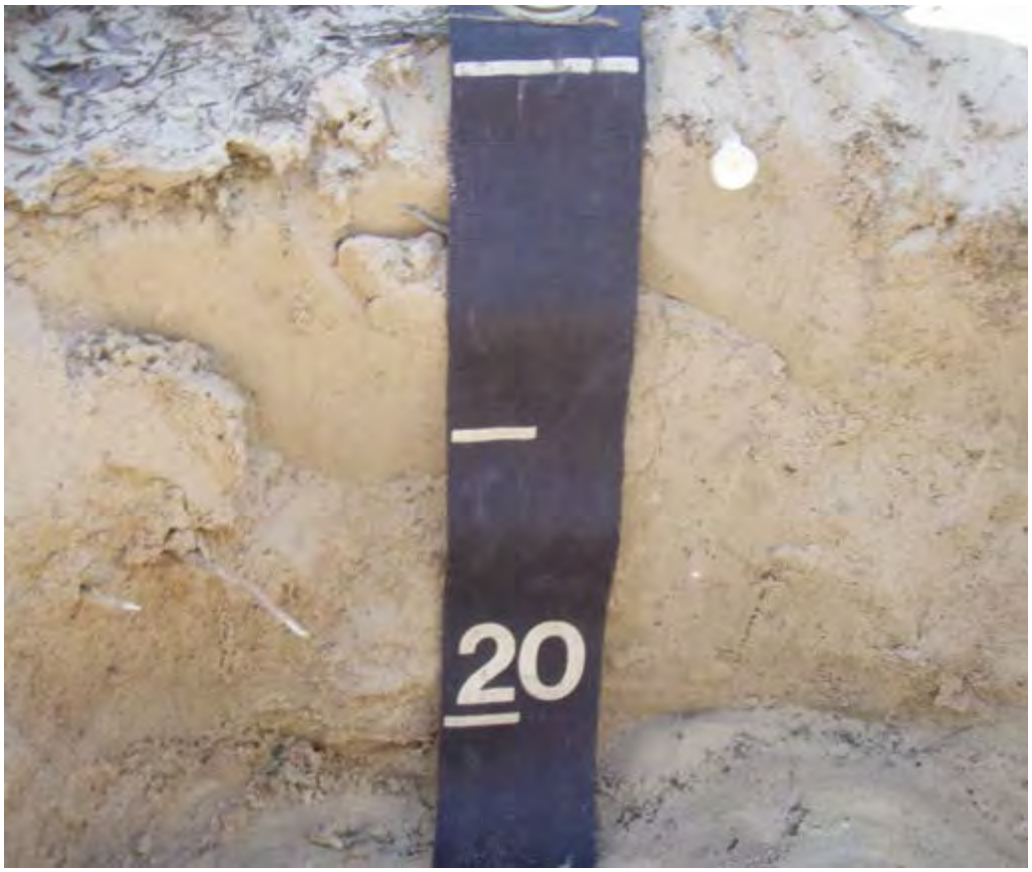

Figure 308.—Profile of the Nalcase soil in map unit 88 (Rock outcrop-Nalcase complex, 2 to 30 percent slopes). Bedrock is at a depth of 23 centimeters. Scale is in centimeters.

Bare soil	15-25
Cyanobacteria crust	20-30
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 493391 meters E., 4200353 meters N., zone 12

A—0 to 1 inch (0 to 3 centimeters); light yellowish brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/6) moist; 1 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; common very fine and common fine interstitial pores; noneffervescent; slightly alkaline, pH 7.4; abrupt wavy boundary.

C—1 to 9 inches (3 to 23 centimeters); light yellowish brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/6) moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common very fine, common fine, and common medium roots throughout; common very fine and common fine interstitial pores; noneffervescent; slightly alkaline, pH 7.6; abrupt wavy boundary.

R—9 to 19 inches (23 to 48 centimeters); indurated, unfractured sandstone.

Range in Characteristics

A horizon:
Hue—10YR or 7.5YR
Value—4 or 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—0 to 10 percent
Rock fragments—0 to 10 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizon:
Hue—10YR or 7.5YR
Value—4 or 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—0 to 10 percent
Rock fragments—0 to 20 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

89—Rock outcrop-Needle complex, 2 to 30 percent slopes

Map Unit Setting

General setting: Sites adjacent to Glen Canyon National Recreation Area and the Waterpocket Fold
Major land resource area: 35—Colorado Plateau
Elevation: 3,720 to 5,070 feet (1,133 to 1,545 meters)
Mean annual precipitation: 6 to 10 inches (150 to 250 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days

Map Unit Composition

Rock outcrop: 60 percent
Needle and similar soils: 35 percent
Minor components (15 percent):
Shallow to deep, sandy-skeletal soils on talus slopes and structural benches (desert, mesic)
Moderately deep to very deep, sandy soils on dunes and sand sheets on mesas and structural benches (desert, mesic)

Description of the Rock Outcrop

This component consists of sandstone bedrock that is typically exposed along ledges and slick rock areas (Navajo, Wingate, or Cedar Mesa Sandstone). It also includes areas where the depth to bedrock is less than 4 inches (10 centimeters).

Description of the Needle Soil

Taxonomic classification: Mixed, mesic Lithic Torripsamments
Landform: Sand sheets on interfluves on hills, mesas, and structural benches
Geology: Navajo Sandstone (Jurassic)
Parent material: Eolian sands derived from sandstone
Slope: 2 to 30 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 12 inches

Drainage class: Excessively drained
Slowest permeability: More than 20 in/hr (very rapid)
Available water capacity (total inches): About 0.7 (very low)
Shrink-swell potential: About 1.0 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 2 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Sandstone Rockland 6-10” p.z.
Ecological site number: R035XB255AZ
Present vegetation (in most areas): Blackbrush, broom snakeweed, and black grama
Land capability classification (nonirrigated areas): 7c
Ground cover (percent):

Plant canopy	7
Litter (<5 mm)	8
Rock fragments	12
Bare soil	19
Cyanobacteria crust	3
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 454460 meters E., 4086346 meters N., zone 12

A—0 to 1 inch (0 to 3 centimeters); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6) moist; 6 percent clay; weak thin platy structure; soft, loose, nonsticky and nonplastic; many fine roots throughout; common fine tubular pores; very slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear smooth boundary.

C—1 to 11 inches (3 to 28 centimeters); yellowish red (5YR 5/6) sand, yellowish red (5YR 4/6) moist; 6 percent clay; massive; soft, loose, nonsticky and nonplastic; many fine and many very fine roots throughout; many fine tubular pores; very slightly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt smooth boundary.

R—11 to 21 inches (28 to 53 centimeters); unweathered, unfractured sandstone.

Range in Characteristics

Reaction: pH 7.4 to 8.4 (slightly alkaline or moderately alkaline)

A horizon:
Value—5 or 6 dry; 3 to 6 moist
Chroma—4 to 6, dry or moist

C horizon:
Hue—2.5YR or 5YR
Value—5 or 6 dry; 4 to 6 moist
Chroma—4 to 6, dry or moist
Texture—sand or fine sand
Clay content—2 to 7 percent
Rock fragments—0 to 3 percent

90—Rock outcrop-Mezzo family-Strell family complex, 2 to 45 percent slopes

Map Unit Setting

General setting: Western part of the Waterpocket Fold, Capitol Reef National Park
Major land resource area: 35—Colorado Plateau
Elevation: 6,060 to 8,970 feet (1,847 to 2,735 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 44 to 46 degrees F (6.7 to 7.8 degrees C)
Mean annual soil temperature: 46 to 48 degrees F (7.8 to 8.9 degrees C)
Frost-free period: 120 to 140 days

Map Unit Composition

Rock outcrop, Navajo Sandstone: 50 percent
Mezzo family, dry and similar soils: 30 percent
Strell family and similar soils: 15 percent
Minor components (5 percent) and their ecological sites:
- Mathis, cool soils on talus slopes (deep and very deep, sandy-skeletal soils); Upland Stony Sand (Utah Juniper-Pinyon)
- Riverwash with no vegetation

Description of the Rock Outcrop, Navajo Sandstone

This component is characterized by nearly level to strongly sloping rock outcrop with many very tall cliffs and escarpments. The continuity of the cliffs ranges from nearly continuous to broken. The lithology is Navajo Sandstone. The vertical relief ranges from a few feet to several hundreds of feet. Typically, there are enough cliffs to make travel by any type of wheeled vehicle nearly impossible, although the nearly level to strongly sloping areas may be negotiated with care. Travel by foot is extremely difficult and strenuous and is usually hazardous. This component is typically a natural barrier to livestock. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

Description of the Mezzo Family, Dry Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau whereas the Mezzo series occurs in MLRA 47—Wasatch and Uintah Mountains. A dry phase is assigned to this soil to account for the pinyon and juniper vegetation.

Taxonomic classification: Frigid, coated Ustic Quartzipsamments (fig. 309)
Landform: Sand sheets on structural benches, dunes on structural benches, mesas, and buttes (fig. 310)
Geology: Navajo Sandstone (Jurassic)
Parent material: Slope alluvium derived from sandstone and/or eolian sand derived from sandstone over residuum weathered from sandstone
Slope: 2 to 15 percent, west aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 3.7 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches

Figure 309.—Profile of the Mezzo family soil in map unit 90 (Rock outcrop-Mezzo family-Strell family complex, 2 to 45 percent slopes). Scale is in centimeters.

Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Sand (Utah Juniper-Pinyon)
Ecological site number: R035XY324UT
Present vegetation (in most areas): Twoneedle pinyon, blue grama, needle and thread, Utah juniper, brittle pricklypear, and Utah serviceberry

Figure 310.—The Mezzo family soil in map unit 90 (Rock outcrop-Mezzo family-Strell family complex, 2 to 45 percent slopes) on structural benches. Strell family soils are visible on the slightly higher bench in the middle-right of the photo.

Land capability classification (nonirrigated areas): 4s
Ground cover (percent): (fig. 311)

Plant canopy	30-45
Litter (<5 mm)	10-20
Rock fragments	0-10
Bare soil	25-35
Cyanobacteria crust	0-10
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 466102 meters E., 4252434 meters N., zone 12

A1—0 to 1.5 inches (0 to 4 centimeters); light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; 5 percent clay; weak medium granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots throughout; many very fine irregular pores; very slightly effervescent; slightly alkaline, pH 7.4; very abrupt smooth boundary.

A2—1.5 to 6.5 inches (4 to 16 centimeters); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/3) moist; 7 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots

throughout; many very fine irregular pores; very slightly effervescent; slightly alkaline, pH 7.4; abrupt smooth boundary.

C1—6.5 to 23 inches (16 to 58 centimeters); pink (7.5YR 7/4) fine sand, strong brown (7.5YR 4/6) moist; 2 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, few fine, and few medium roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—23 to 59 inches (58 to 150 centimeters); pink (7.5YR 7/4) fine sand, reddish brown (5YR 5/4) moist; 2 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine and few medium roots throughout; many very fine irregular pores; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizons:

Hue—7.5YR or 10YR
Value—4 or 6, dry or moist
Chroma—3 or 4, dry or moist
Clay content—2 to 7 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizons:

Hue—5YR or 7.5YR
Value—6 or 7 dry; 4 or 5 moist

Figure 311.—Typical surface of the Mezzo family soil in map unit 90 (Rock outcrop-Mezzo family-Strell family complex, 2 to 45 percent slopes) exhibiting a well developed biotic crust.

Figure 312.—Profile of the Strell family soil in map unit 90 (Rock outcrop-Mezzo family-Strell family complex, 2 to 45 percent slopes). Bedrock is at a depth of 20 centimeters. Scale is in centimeters.

Chroma—4 or 6, dry or moist
Texture—fine sandy loam or fine sand
Clay content—2 to 5 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

Description of the Strell Family Soil

Note: This soil is correlated at the family level because it occurs in MLRA 35—Colorado Plateau whereas the Strell series occurs in MLRA 47—Wasatch and Uintah Mountains.

Taxonomic classification: Frigid, coated Lithic Quartzipsamments (fig. 312)
Landform: Sand sheets on structural benches, shrub-coppice dunes on structural benches, mesas, or buttes (fig. 313)
Geology: Navajo Sandstone (Jurassic)
Parent material: Slope alluvium derived from sandstone and/or eolian sand derived from sandstone over residuum weathered from sandstone
Slope: 2 to 45 percent, west aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 6 to 16 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 0.7 (very low)

Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: D
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Two-Needle Pinyon)
Ecological site number: R035XY019UT
Present vegetation (in most areas): Littleleaf mountain mahogany, twoneedle pinyon, singleleaf ash, Utah juniper, and Bigelow sage
Land capability classification (nonirrigated areas): 6s

Figure 313.—The Strell family soil in map unit 90 (Rock outcrop-Mezzo family-Strell family complex, 2 to 45 percent slopes) on coppice dunes on structural benches.

Ground cover (percent):

Plant canopy	40-50
Litter (<5 mm)	5-15
Rock fragments	5-20
Bare soil	5-20
Cyanobacteria crust	5-20
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 466295 meters E., 4251789 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; 3 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and few very fine roots throughout; many very fine interstitial pores; noneffervescent; neutral, pH 7.2; clear smooth boundary.

C—3.5 to 8 inches (9 to 20 centimeters); light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; 4 percent clay; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many very fine interstitial pores; 3 percent gravel; noneffervescent; slightly alkaline, pH 7.4; abrupt wavy boundary.

R—8 to 17.5 inches (20 to 45 centimeters); very strongly cemented sandstone; few very fine, few fine, and common medium roots at top of horizon.

Range in Characteristics

A horizon:

Value—6 or 7 dry; 4 to 6 moist
Texture—fine sand, loamy fine sand, or fine sandy loam
Clay content—2 to 5 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

C horizon:

Value—6 or 7 dry; 4 or 5 moist
Texture—fine sand, loamy fine sand, or fine sandy loam
Clay content—3 to 5 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 3 percent paragravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

91—Rock outcrop-Santrick-Nalcase complex, 2 to 30 percent slopes

Map Unit Setting

General setting: The Waterpocket Fold, Capitol Reef National Park (fig. 314)
Major land resource area: 35—Colorado Plateau
Elevation: 5,030 to 7,100 feet (1,532 to 2,163 meters)

Figure 314.—Landscape of map unit 91 (Rock outcrop-Santrick-Nalcase complex, 2 to 30 percent slopes).

Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days.

Map Unit Composition

Rock outcrop, Navajo Sandstone: 50 percent
Santrick and similar soils: 30 percent
Nalcase and similar soils: 15 percent
Minor components (5 percent) and their ecological sites:
Deep and very deep, sandy-skeletal soils on talus slopes; Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)

Description of the Rock Outcrop, Navajo Sandstone

This component is characterized by nearly level to strongly sloping rock outcrop with many very tall cliffs and escarpments. The continuity of the cliffs ranges from nearly continuous to broken. The lithology is Navajo Sandstone. The vertical relief ranges from a few feet to several hundreds of feet. Typically, there are enough cliffs to make travel by any type of wheeled vehicle nearly impossible, although the nearly level to strongly sloping areas may be negotiated with care. Travel by foot is extremely difficult and strenuous and is usually hazardous. This component is typically a natural barrier to livestock. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

Figure 315.—Profile of the Santrick soil in map unit 91 (Rock outcrop-Santrick-Nalcase complex, 2 to 30 percent slopes). Scale is in centimeters.

Description of the Santrick Soil

Taxonomic classification: Siliceous, mesic Ustic Torripsamments (fig. 315)
Landform: Sand sheets and dunes on cuestas
Geology: Navajo Sandstone (Jurassic)
Parent material: Slope alluvium derived from sandstone and/or eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 2 to 30 percent, northeast to north aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 20 to 40 inches
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 2.2 (very low)

Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sand (Utah Juniper-Pinyon)
Ecological site number: R035XY227UT
Present vegetation (in most areas): Utah juniper, twoneedle pinyon, littleleaf mountain mahogany, Utah serviceberry, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	5-15
Rock fragments	15-25
Bare soil	20-40
Cyanobacteria crust	10-20
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 497605 meters E., 4189563 meters N., zone 12

C1—0 to 5 inches (0 to 13 centimeters); light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; 5 percent clay; massive; very friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine interstitial pores; noneffervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C2—5 to 20 inches (13 to 51 centimeters); very pale brown (10YR 7/4) loamy fine sand, yellowish brown (10YR 5/4) moist; 4 percent clay; massive; very friable, slightly sticky and nonplastic; few fine, few medium, and few coarse roots throughout; many very fine interstitial pores; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C3—20 to 25 inches (51 to 64 centimeters); yellow (10YR 7/6) loamy sand, yellowish brown (10YR 5/6) moist; 5 percent clay; massive; friable, nonsticky and nonplastic; few fine roots throughout; common medium, common very fine, and common fine irregular pores; 5 percent gravel; very slightly effervescent; moderately alkaline, pH 8.0; abrupt smooth boundary.

R—25 to 35 inches (64 to 89 centimeters); very strongly cemented Navajo Sandstone.

Range in Characteristics

Note: Some pedons have a thin A horizon at the surface

C horizons:
Value—6 or 7 dry; 5 or 6 moist
Chroma—4 or 6, dry or moist
Texture—fine sand, loamy fine sand, or loamy sand
Clay content—1 to 8 percent
Rock fragments—0 to 10 percent gravel or cobbles

Figure 316.—Profile of the Nalcase soil in map unit 91 (Rock outcrop-Santrick-Nalcase complex, 2 to 30 percent slopes). Scale is in centimeters.

Description of the Nalcase Soil

Taxonomic classification: Siliceous, mesic Lithic Torripsamments (fig. 316)
Landform: Sand sheets and dunes on cuestas
Geology: Navajo Sandstone (Jurassic)
Parent material: Slope alluvium derived from sandstone and/or eolian sands derived from sandstone over residuum weathered from sandstone
Slope: 2 to 30 percent, northeast to north aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Shallow Sand Rock Pocket (Utah Juniper/Two-Needle Pinyon)
Ecological site number: R035XY019UT

Present vegetation (in most areas): Littleleaf mountain mahogany, Utah juniper, needle and thread, twoneedle pinyon, and singleleaf ash
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	45-55
Litter (<5 mm)	10-20
Rock fragments	0-10
Bare soil	10-30
Cyanobacteria crust	5-20
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 497751 meters E., 4189426 meters N., zone 12

C1—0 to 2 inches (0 to 5 centimeters); light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; 5 percent clay; massive; very friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine interstitial pores; noneffervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.
C2—2 to 7 inches (5 to 18 centimeters); light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; 4 percent clay; massive; very friable, slightly sticky and nonplastic; few fine, few medium, and few coarse roots throughout; many very fine interstitial pores; noneffervescent; moderately alkaline, pH 8.0; clear smooth boundary.
C3—7 to 11.5 inches (18 to 29 centimeters); brownish yellow (10YR 6/6) loamy sand, yellowish brown (10YR 5/6) moist; 5 percent clay; massive; friable, slightly sticky and nonplastic; few fine roots throughout; common medium, common very fine, and common fine irregular pores; 10 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.
R—11.5 to 21.5 inches (29 to 54 centimeters); very strongly cemented, slightly weathered and unfractured sandstone.

Range in Characteristics

C horizons:
Value—6 or 7 dry; 5 or 6 moist
Chroma—4 or 6, dry or moist
Texture—fine sand, loamy fine sand, or loamy sand
Clay content—1 to 8 percent
Rock fragments—0 to 10 percent gravel or cobbles
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

92—Rock outcrop-Typic Torriorthents complex, 20 to 65 percent slopes, extremely bouldery

Map Unit Setting

General setting: Sites adjacent to Glen Canyon National Recreation Area, talus slopes, and escarpments along Halls Creek
Major land resource area: 35—Colorado Plateau
Elevation: 3,700 to 4,880 feet (1,127 to 1,488 meters)

Mean annual precipitation: 6 to 10 inches (150 to 250 millimeters)
Mean annual air temperature: 54 to 57 degrees F (12.0 to 14.0 degrees C)
Mean annual soil temperature: 56 to 59 degrees F (13.1 to 15.1 degrees C)
Frost-free period: 150 to 180 days

Map Unit Composition

Note: An extremely bouldery phase is assigned to this map unit because 15 to 20 percent of the soil surface is covered by stones and boulders.

Rock outcrop: 60 percent
Typic Torriorthents and similar soils: 40 percent

Description of the Rock Outcrop

This component consists of sandstone bedrock that is typically exposed on ledges and cliff faces (Wingate, Navajo, or Entrada Sandstone). It also includes areas where the depth to bedrock is less than 4 inches (10 centimeters).

Description of the Typic Torriorthents

Note: This component is correlated at the great group level because the content of rock fragments in the particle-size control section ranges from 0 to 65 percent. The variability of this characteristic exceeds family class limits.

Taxonomic classification: Typic Torriorthents
Landform: Talus slopes
Geology: Navajo Sandstone (Jurassic)
Parent material: Sandy and gravelly talus derived from sandstone and shale
Slope: 20 to 65 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 20 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 1.4 (very low)
Shrink-swell potential: About 1.0 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Talus Slope (Blackbrush-Shadscale)
Ecological site number: R035XY018UT
Present vegetation (in most areas): Fourwing saltbush, galleta, skeletonweed buckwheat, and Torrey Mormon tea
Land capability classification (nonirrigated areas): 7c
Ground cover (percent):

Plant canopy	4
Litter (<5 mm)	4
Rock fragments	44
Bare soil	27
Cyanobacteria crust	2
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 442718 meters E., 4077248 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); reddish brown (2.5YR 5/4) channery loam, dark reddish brown (2.5YR 3/4) moist; 18 percent clay; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; common very fine roots throughout; common very fine tubular pores; 25 percent channers and 5 percent parachanners; slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear wavy boundary.

C1—2 to 10 inches (5 to 25 centimeters); reddish brown (5YR 5/4) very flaggy coarse sandy loam, dark reddish brown (5YR 3/4) moist; 10 percent clay; massive; loose, nonsticky and nonplastic; common fine and common very fine roots throughout; 20 percent channers, 10 percent parachanners, and 20 percent flagstones; slightly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear irregular boundary.

C2—10 to 17 inches (25 to 43 centimeters); reddish brown (2.5YR 4/4) extremely parachannery coarse sandy loam, dark reddish brown (2.5YR 3/4) moist; 10 percent clay; massive; loose, nonsticky and nonplastic; common fine and many very fine roots throughout; 60 percent parachanners; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.8; clear wavy boundary.

Cr—17 to 27 inches (43 to 68 centimeters); moderately cemented, weathered sandstone.

Range in Characteristics

Reaction: pH 7.4 to 8.4 (slightly alkaline or moderately alkaline)

A horizon:
Hue—2.5YR, 5YR, 7.5YR, or 10YR
Value—5 to 7 dry; 3 to 6 moist
Chroma—3 or 4, dry or moist

C horizons:
Hue—2.5YR, 5YR, 7.5YR, or 10YR
Value—4 to 7 dry; 3 to 6 moist
Chroma—4 or 6, dry or moist
Texture—coarse sandy loam or sandy loam
Clay content—8 to 12 percent
Rock fragments—0 to 65 percent

93—Rosced family-Quezcan, sodic complex, 15 to 70 percent slopes

Map Unit Setting

General setting: Canyons west of the Waterpocket Fold and areas between Pleasant Creek and Burr Trail
Major land resource area: 35—Colorado Plateau
Elevation: 5,720 to 7,590 feet (1,742 to 2,314 meters)
Mean annual precipitation: 13 to 16 inches (330 to 406 millimeters)
Mean annual air temperature: 45 to 47 degrees F (7.2 to 8.3 degrees C)
Mean annual soil temperature: 47 to 49 degrees F (8.3 to 9.4 degrees C)
Frost-free period: 120 to 140 days

Map Unit Composition

Rosced family and similar soils: 60 percent

Quezcan, sodic and similar soils: 25 percent
Minor components (15 percent) and their ecological sites:
Nizhoni soils on structural benches (shallow, loamy soils); Upland Shallow Loam (Pinyon-Utah Juniper)
Rock outcrop (Wingate Sandstone)

Description of the Rosced Family Soil

Note: This soil is correlated at the family level because it formed in colluvial deposits from Wingate Sandstone and has flagstones and stones in the control section. The Rosced series formed in alluvial sediments from igneous and sedimentary rock and has gravel and cobbles in the control section.

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Aridic Haplustepts (fig. 317)
Landform: Side slopes of canyons (fig. 318)
Geology: Quaternary colluvial deposits from Wingate Sandstone
Parent material: Colluvium derived from sandstone
Slope: 15 to 60 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 2.9 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Upland Steep Stony Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY317UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, alderleaf mountain mahogany, Indian ricegrass, galleta, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	30-45
Litter (<5 mm)	10-20
Rock fragments	25-45
Bare soil	15-25
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 490372 meters E., 4205366 meters N., zone 12

A—0 to 3 inches (0 to 7 centimeters); light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; 6 percent clay; moderate medium granular and moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots throughout; many very fine and many fine irregular pores;

Figure 317.—Profile of the Rosced family soil in map unit 93 (Rosced family-Quezcan, sodic complex, 15 to 70 percent slopes). Scale is in centimeters.

5 percent channers; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

AB—3 to 10 inches (7 to 26 centimeters); brown (7.5YR 5/3) very flaggy sandy loam, brown (7.5YR 4/3) moist; 8 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine, common fine, and common coarse roots throughout; many very fine irregular pores; 20 percent gravel, 5 percent parachanners, 20 percent flagstones, and 5 percent stones; slightly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

Bw—10 to 23.5 inches (26 to 60 centimeters); light reddish brown (5YR 6/4) extremely stony sandy loam, reddish brown (5YR 5/4) moist; 15 percent clay; weak fine subangular blocky structure; moderately hard, friable, slightly sticky and slightly plastic; few very fine, common fine, common medium, common coarse, and

Figure 318.—Landscape of the Rosced family soil in map unit 93 (Rosced family-Quezcan, sodic complex, 15 to 70 percent slopes).

common very coarse roots throughout; many very fine irregular pores; 15 percent gravel, 5 percent cobbles, and 40 percent stones; strongly effervescent; strongly alkaline, pH 8.6; clear smooth boundary.

C—23.5 to 71 inches (60 to 180 centimeters); light reddish brown (5YR 6/4) extremely bouldery sandy loam, reddish brown (5YR 5/4) moist; 7 percent clay; massive; moderately hard, friable, slightly sticky and slightly plastic; many very fine irregular pores; 15 percent gravel, 10 percent cobbles, 10 percent stones, and 40 percent boulders; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Hue—5YR or 7.5YR
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—5 to 15 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—5 to 45 percent gravel, cobbles, and stones
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

BA, AB, or Bw horizons:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 to 6, dry or moist
Texture—sandy loam or fine sandy loam

Clay content—5 to 15 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones
Reaction—slightly alkaline to strongly alkaline (pH 7.4 to 9.0)

C horizon:
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam, fine sandy loam, or loamy fine sand
Clay content—5 to 10 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 75 percent gravel, cobbles, and stones
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Quezcan, Sodic Soil

Note: A sodic phase and a semidesert ecological site are assigned to this aridic ustic soil because the high pH and chemistry of the soil restrict plant growth.

Taxonomic classification: Fine, smectitic, calcareous, mesic Aridic Ustorthents (fig. 319)
Landform: Side slopes of canyons and hills (fig. 320)
Geology: Chinle Formation (Triassic)
Parent material: Slope alluvium derived from shale and siltstone over residuum weathered from shale and siltstone
Slope: 35 to 70 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 20 to 40 inches
Drainage class: Well drained
Slowest permeability: 0.06 to 0.2 in/hr (slow)
Available water capacity (total inches): About 3.6 (low)
Shrink-swell potential: About 7.5 LEP (high)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Shallow Clay (Shadscale-Utah Juniper)
Ecological site number: R035XY239UT
Present vegetation (in most areas): Galleta, Utah juniper, low rabbitbrush, needle and thread, Torrey's jointfir, and shadscale
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	15-25
Litter (<5 mm)	0-10
Rock fragments	15-25
Bare soil	40-60
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 319.—Profile of the Quezcan, sodic soil in map unit 93 (Rosced family-Quezcan, sodic complex, 15 to 70 percent slopes). Scale is in centimeters.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 486607 meters E., 4212056 meters N., zone 12

C1—0 to 7.5 inches (0 to 19 centimeters); pale yellow (2.5Y 8/2) sandy clay loam, light gray (2.5Y 7/2) moist; 31 percent clay; moderate medium subangular blocky structure; slightly hard, friable, very sticky and very plastic; many very fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C2—7.5 to 23 inches (19 to 58 centimeters); light yellowish brown (2.5Y 6/3) sandy clay, light olive brown (2.5Y 5/4) moist; 36 percent clay; moderate medium angular blocky structure; slightly hard, friable, very sticky and very plastic; common very fine and common fine irregular pores; slightly effervescent; strongly alkaline, pH 8.8; abrupt smooth boundary.

Cr—23 to 34.5 inches (58 to 88 centimeters); light brownish gray (2.5Y 6/2), moist, very weakly cemented, fractured mudstone.

Range in Characteristics

C horizons:

Hue—2.5YR to 2.5Y
Value—5 to 8 dry; 4 to 7 moist
Chroma—2 to 4, dry or moist
Texture—clay loam, clay, silty clay loam, silty clay, sandy clay loam, or sandy clay
Clay content—30 to 45 percent; averaging more than 35 percent in the particle-size control section
Calcium carbonate equivalent—0 to 10 percent
Gypsum content—0 to 2 percent
SAR—0 to 5
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—0 to 10 percent gravel or paragravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

94—Saemo gravelly fine sandy loam, 15 to 50 percent slopes

Map Unit Setting

General setting: Red Slide, Capitol Reef National Park (fig. 321)
Major land resource area: 35—Colorado Plateau
Elevation: 4,280 to 5,990 feet (1,306 to 1,826 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)

Figure 320.—Landscape of the Quezcan, sodic soil in map unit 93 (Rosced family-Quezcan, sodic complex, 15 to 70 percent slopes).

Figure 321.—Landscape of map unit 94 (Saemo gravelly fine sandy loam, 15 to 50 percent slopes) on Red Slide.

Mean annual air temperature: 46 to 54 degrees F (7.8 to 12.2 degrees C)
Mean annual soil temperature: 48 to 56 degrees F (8.9 to 13.3 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Saemo and similar soils: 95 percent
Minor components (5 percent):
Rock outcrop (Navajo Sandstone)

Description of the Saemo Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplargids (fig. 322)
Landform: Landslides
Geology: Quaternary colluvial deposits
Parent material: Colluvium derived from sandstone and shale and/or slope alluvium derived from sandstone and shale over residuum weathered from sandstone and shale
Slope: 15 to 50 percent, north to southeast aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 5.7 (moderate)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None

Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Loam (Shadscale)
Ecological site number: R035XY242UT
Present vegetation (in most areas): Galleta, rubber rabbitbrush, shadscale, blackbrush, Indian ricegrass, low rabbitbrush, and Wright's bird's beak
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	20-30
Litter (<5 mm)	0-10

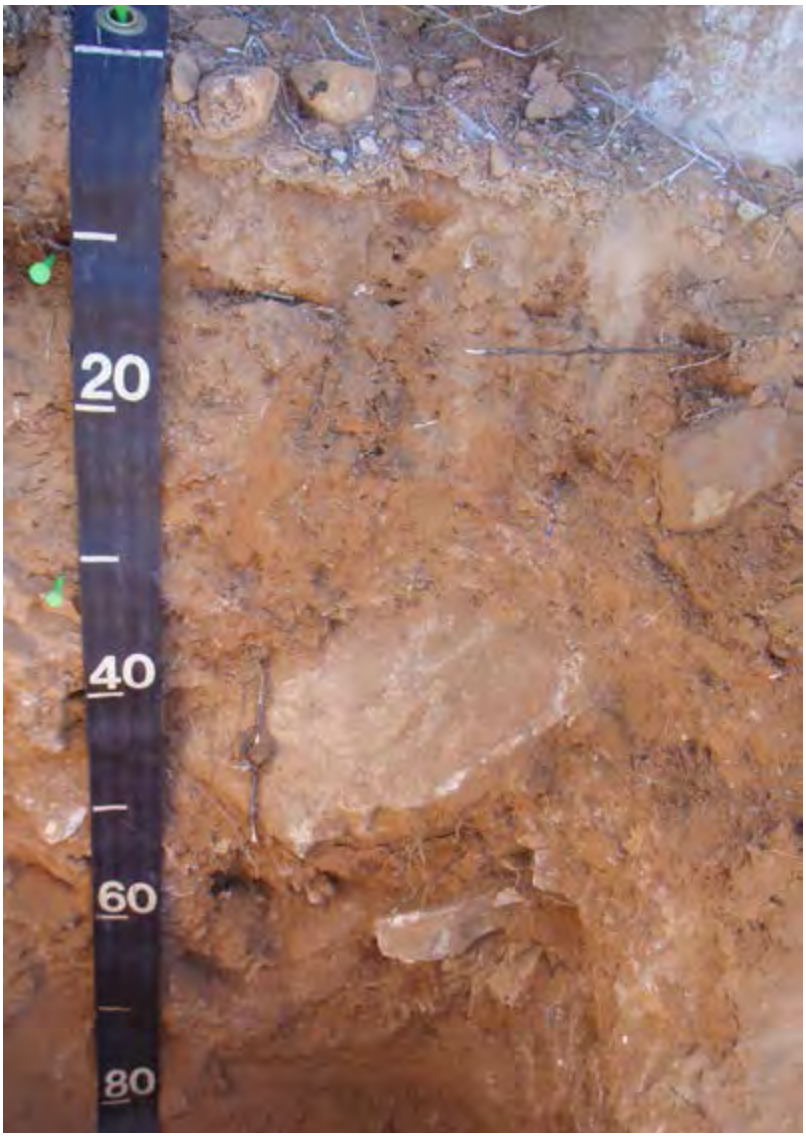

Figure 322.—Profile of the Saemo soil in map unit 94 (Saemo gravelly fine sandy loam, 15 to 50 percent slopes). Scale is in centimeters.

Rock fragments	50-60
Bare soil	10-20
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0-2
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 505857 meters E., 4171776 meters N., zone 12

A—0 to 4.5 inches (0 to 12 centimeters); red (2.5YR 5/6) gravelly fine sandy loam, red (2.5YR 4/6) moist; 12 percent clay; weak very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and few very fine roots throughout; many very fine irregular pores; 10 percent gravel, 4 percent cobbles, and 4 percent stones; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bt—4.5 to 12.5 inches (12 to 32 centimeters); red (2.5YR 5/6) stony very fine sandy loam, reddish brown (2.5YR 4/4) moist; 18 percent clay; moderate medium platy structure; slightly hard, friable, moderately sticky and moderately plastic; few very fine and few fine roots throughout and common medium roots at top of horizon; common very fine irregular pores; few discontinuous distinct clay films on all faces of peds and few discontinuous distinct clay films between sand grains; 10 percent gravel, 5 percent cobbles, and 5 percent stones; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

BCt—12.5 to 33.5 inches (32 to 85 centimeters); light red (2.5YR 6/6) very stony fine sandy loam, red (2.5YR 5/6) moist; 15 percent clay; moderate coarse angular blocky and moderate medium angular blocky structure; hard, very firm, moderately sticky and slightly plastic; few very fine, few fine, and common medium roots throughout; common very fine irregular pores; few discontinuous distinct clay films on all faces of peds; 15 percent gravel, 10 percent cobbles, and 15 percent stones; slightly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C—33.5 to 59 inches (85 to 150 centimeters); light red (2.5YR 6/6) very stony fine sandy loam, red (2.5YR 5/6) moist; 11 percent clay; massive; moderately hard, firm, slightly sticky and nonplastic; few fine roots throughout; common very fine irregular pores; 15 percent gravel, 10 percent cobbles, and 10 percent stones; slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Rock fragment content in the particle-size control section: Average of more than 35 percent

A horizon:

Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, loam, clay loam, or sandy clay loam
Clay content—12 to 30 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—10 to 70 percent gravel, cobbles, and stones
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Bt and BCt horizons:

Value—5 or 6 dry; 4 or 5 moist

Chroma—4 or 6, dry or moist
Texture—fine sandy loam, very fine sandy loam, loam, clay loam, or sandy clay loam
Clay content—15 to 32 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—20 to 70 percent gravel, cobbles, and stones
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C horizon:
Hue—2.5YR or 10R
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam, loam, or sandy clay loam
Clay content—10 to 28 percent
Calcium carbonate equivalent—5 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 70 percent gravel, cobbles, and stones
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Sameo soil differs from the Saemo series in that it is slightly effervescent and moderately alkaline throughout the profile; the sand fraction of the fine-earth part of the soil is mainly fine sand and finer; hue is 2.5YR and 5YR; and the soil formed in landslide debris. The Saemo series is neutral throughout and noneffervescent in the upper part; the sands are mostly medium or coarser; hue is 7.5YR and 10YR; and the soils formed in alluvium on fan terraces.

95—Sandyranch-Aquic Torrifluvents-Water complex, 2 to 15 percent slopes

Map Unit Setting

General setting: Halls Creek Narrows, Capitol Reef National Park (fig. 323)
Major land resource area: 35—Colorado Plateau
Elevation: 3,910 to 4,660 feet (1,193 to 1,419 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Sandyranch and similar soils: 40 percent
Aquic Torrifluvents and similar soils: 15 percent
Water: 15 percent
Minor components (20 percent) and their ecological sites:
Riverwash in channels with no vegetation
Rock outcrop (Navajo Sandstone)
Very deep, sandy-skeletal soils on talus slopes; Talus Slope (Blackbrush-Shadscale)

Description of the Sandyranch Soil

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 324)
Landform: Stream terraces (fig. 325)
Geology: Quaternary alluvium and eolian deposits
Parent material: Alluvium derived from sandstone

Figure 323.—Landscape of map unit 95 (Sandyranch-Aquic Torrifluvents-Water complex, 2 to 15 percent slopes) in Halls Creek Narrows.

Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 4.8 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Sandy Bottom (Fourwing Saltbush)
Ecological site number: R035XY015UT
Present vegetation (in most areas): Boxelder, fourwing saltbush, Indian ricegrass, mesa dropseed, and rubber rabbitbrush
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	40-50
Litter (<5 mm)	10-20
Rock fragments	0
Bare soil	30-40
Cyanobacteria crust	5-15

Lichen crust	0
Moss crust	0-10
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 509382 meters E., 4164271 meters N., zone 12

Figure 324.—Profile of the Sandyranch soil in map unit 95 (Sandyranch-Aquic Torrifluvents-Water complex, 2 to 15 percent slopes). Scale is in centimeters.

Figure 325.—The Sandyranch soil in map unit 95 (Sandyranch-Aquic Torrifluvents-Water complex, 2 to 15 percent slopes) on stream terraces, in the foreground.

A—0 to 3.5 inches (0 to 9 centimeters); reddish brown (5YR 5/4) loamy fine sand, dark reddish brown (5YR 3/4) moist; 5 percent clay; weak fine subangular blocky structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; many very fine roots throughout; many very fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C1—3.5 to 49 inches (9 to 125 centimeters); reddish yellow (5YR 6/6) fine sand, brown (7.5YR 4/4) moist; 2 percent clay; massive; soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

C2—49 to 55 inches (125 to 140 centimeters); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/3) moist; 5 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—55 to 75.5 inches (140 to 192 centimeters); reddish yellow (5YR 7/6) fine sand, reddish brown (5YR 4/4) moist; 2 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine roots throughout; many very fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:

Hue—7.5YR or 5YR
Value—5 or 6 dry; 3 or 4 moist
Texture—fine sand or loamy fine sand
Clay content—1 to 8 percent

Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizons:
Hue—7.5YR or 5YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—4 or 6 dry; 3 to 6 moist
Texture—fine sand or loamy fine sand
Clay content—1 to 6 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

Description of the Aquic Torrifluvents

Note: These soils are correlated at the subgroup level because the variability of their soil characteristics exceeds family class limits.

Taxonomic classification: Aquic Torrifluvents
Landform: Flood plains (fig. 326)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 2 to 15 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 20 to 60 inches

Figure 326.—The Aquic Torrifluvents in map unit 95 (Sandyranch-Aquic Torrifluvents-Water complex, 2 to 15 percent slopes) on the active flood plain of Halls Creek.

Drainage class: Somewhat poorly drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 4.2 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Frequent
Ponding hazard: None
Seasonal water table (minimum depth): About 4 to 8 inches
Runoff class: Low
Hydrologic group: A/D
Calcium carbonate content (maximum): About 4 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex (Valley Type IV - F1/G1 Stream Types)
Ecological site number: R035XY029UT
Present vegetation (in most areas): Baltic rush, Fremont cottonwood, horsetail, and willow
Land capability classification (nonirrigated areas): 7w
Ground cover (percent):

Plant canopy	70-80
Litter (<5 mm)	5-15
Rock fragments	0-5
Bare soil	10-20
Cyanobacteria crust	0-2
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 509525 meters E., 4164067 meters N., zone 12

A—0 to 6 inches (0 to 15 centimeters); pink (7.5YR 7/4) loam, brown (7.5YR 4/4) moist; 15 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; common very fine, common fine, and common medium roots throughout; common very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.0; clear smooth boundary.

AC—6 to 17.5 inches (15 to 45 centimeters); pink (7.5YR 7/4) fine sandy loam, brown (7.5YR 4/4) moist; 11 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine, common fine, and common medium roots throughout; common very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C1—17.5 to 28.5 inches (45 to 73 centimeters); 10 percent reddish yellow (7.5YR 6/6), 15 percent reddish yellow (7.5YR 7/6), and 70 percent light yellowish brown (10YR 6/4) loamy sand, 10 percent strong brown (7.5YR 4/6), 15 percent strong brown (7.5YR 5/6), and 70 percent dark yellowish brown (10YR 4/4) moist; 6 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine, common fine, and common medium roots throughout; common very fine interstitial pores; 25 percent coarse irregular masses of oxidized iron in matrix; 1 percent gravel; very slightly effervescent; neutral, pH 7.2; abrupt smooth boundary.

C2—28.5 to 40 inches (73 to 102 centimeters); very dark gray (7.5YR 3/1) loamy sand, very dark gray (7.5YR 3/1) moist; 4 percent clay; massive; soft, very friable, nonsticky and nonplastic; common fine and common medium roots throughout; common very fine interstitial pores; 75 percent coarse irregular iron-manganese

masses in matrix; slightly effervescent; slightly alkaline, pH 7.6; very abrupt smooth boundary.

R—40 to 50 inches (102 to 127 centimeters); indurated, unfractured sandstone.

Range in Characteristics

A horizon:

Value—6 or 7 dry; 4 or 5 moist
Texture—loam or fine sandy loam
Clay content—8 to 18 percent
Calcium carbonate equivalent—0 to 3 percent
Rock fragments—0 to 5 percent gravel
Electrical conductivity—0 to 2 mmhos/cm

AC horizon (if it occurs):

Value—6 or 7 dry; 4 or 5 moist
Texture—fine sandy loam, sandy loam, or loamy fine sand
Clay content—5 to 12 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

C horizons:

Hue—7.5YR or 10YR
Value—5 to 7 dry; 3 to 5 moist
Chroma—1 to 6, dry or moist
Texture—fine sand, loamy sand, or loamy fine sand
Clay content—1 to 6 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

Description of Water

This component consists of streams, ponds, and seeps underlain by sandstone bedrock, often in narrow canyons with high walls. 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.

96—Sandyranch-Mido-Mident complex, 2 to 45 percent slopes

Map Unit Setting

General setting: Strike Valley
Major land resource area: 35—Colorado Plateau
Elevation: 4,960 to 5,800 feet (1,513 to 1,769 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Sandyranch and similar soils: 35 percent
Mido and similar soils: 30 percent
Mident and similar soils: 15 percent

Minor components (20 percent) and their ecological sites:
Riverwash in channels with no vegetation
Querencia, saline-sodic soils on stream terraces (very deep, fine-loamy soils); Desert Loam (Shadscale)
Yarts soils on stream terraces (very deep, coarse-loamy soils); Semidesert Sandy Loam (Fourwing Saltbush)
Calladito family, saline-sodic soils on stream terraces (very deep, sandy soils); Alkali Flat (Greasewood)

Description of the Sandyranch Soil

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 327)
Landform: Flood-plain steps (fig. 328)
Geology: Alluvium and eolian sands (Holocene and Upper Pleistocene)
Parent material: Alluvium derived from calcareous sandstone
Slope: 2 to 15 percent, east to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 3.4 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Occasional
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Loamy Bottom (Basin Big Sagebrush)
Ecological site number: R035XY011UT
Present vegetation (in most areas): Basin big sagebrush, needle and thread, Indian ricegrass, gooseberryleaf globemallow, plains pricklypear, prickly Russian thistle, and rubber rabbitbrush
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	15-25
Rock fragments	0-5
Bare soil	10-120
Cyanobacteria crust	10-30
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 495573 meters E., 4195906 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4) moist; 3 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and many very fine roots throughout; many very fine irregular pores; moderately alkaline, pH 8.0; abrupt wavy boundary.

C1—2 to 9 inches (5 to 23 centimeters); light brown (7.5YR 6/4) fine sand, strong brown (7.5YR 4/6) moist; 2 percent clay; massive; soft, very friable, nonsticky and

Figure 327.—Profile of the Sandyranch soil in map unit 96 (Sandyranch-Mido-Mident complex, 2 to 45 percent slopes). Scale is in centimeters.

nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; moderately alkaline, pH 8.2; abrupt wavy boundary.

C2—9 to 33.5 inches (23 to 85 centimeters); light brown (7.5YR 6/4) sand, brown (7.5YR 5/4) moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; 2 percent gravel; moderately alkaline, pH 8.2; clear wavy boundary.

C3—33.5 to 43.5 inches (85 to 110 centimeters); light brown (7.5YR 6/4) fine sand, strong brown (7.5YR 4/6) moist; 2 percent clay; massive; soft, very friable, nonsticky and nonplastic; common fine roots throughout; many very fine interstitial pores; moderately alkaline, pH 8.2; abrupt wavy boundary.

Figure 328.—The Sandyranch soil in map unit 96 (Sandyranch-Mido-Mident complex, 2 to 45 percent slopes) on flood-plain steps.

C4—43.5 to 59 inches (110 to 150 centimeters); light brown (7.5YR 6/4) gravelly sand, brown (7.5YR 5/4) moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common fine roots throughout; many very fine interstitial pores; 20 percent gravel; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:

Value—3 to 5, dry or moist
Texture—fine sand, loamy sand, loamy fine sand, or very fine sandy loam
Clay content—3 to 12 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 5 percent gravel

C horizons:

Hue—7.5YR or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sand, fine sand, or loamy fine sand
Clay content—1 to 10 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—0 to 20 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Mido Soil

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 329)

Landform: Stream terraces and hills (fig. 330)
Geology: Alluvium and eolian sands (Holocene and Upper Pleistocene)
Parent material: Alluvium derived from calcareous sandstone and/or eolian sands derived from calcareous sandstone
Slope: 2 to 15 percent, northeast to west aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 4.7 (low)

Figure 329.—Profile of the Mido soil in map unit 96 (Sandyranch-Mido-Mident complex, 2 to 45 percent slopes). Scale is in centimeters.

Figure 330.—The Mido soil in map unit 96 (Sandyranch-Mido-Mident complex, 2 to 45 percent slopes) on stream terraces.

Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Negligible
Hydrologic group: A
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sand (Fourwing Saltbush)
Ecological site number: R035XY212UT
Present vegetation (in most areas): Fourwing saltbush, galleta, blue grama, Indian ricegrass, and plains pricklypear
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-35
Litter (<5 mm)	15-30
Rock fragments	0-5
Bare soil	10-20
Cyanobacteria crust	15-35
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 495317 meters E., 4196403 meters N., zone 12

A—0 to 2.5 inches (0 to 6 centimeters); strong brown (7.5YR 5/6) fine sand, brown (7.5YR 4/4) moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bw—2.5 to 9 inches (6 to 23 centimeters); strong brown (7.5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 5 percent clay; moderate coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and common very fine roots throughout; slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

BC—9 to 35.5 inches (23 to 90 centimeters); strong brown (7.5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 4 percent clay; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and common very fine roots throughout; slightly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C—35.5 to 78.5 inches (90 to 200 centimeters); reddish yellow (7.5YR 6/6) fine sand, yellowish red (5YR 5/6) moist; 3 percent clay; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots throughout; slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Texture—fine sand or loamy fine sand
Clay content—1 to 8 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 5 percent gravel

Bw and BC horizons:

Hue—5YR or 7.5YR
Texture—fine sand or loamy fine sand
Clay content—1 to 8 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 5 percent gravel

C horizon:

Hue—5YR or 7.5YR
Chroma—4 or 6, dry or moist
Texture—fine sand or loamy fine sand
Clay content—1 to 8 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 5 percent gravel or channers

Description of the Mident Soil

Taxonomic classification: Mixed, mesic, shallow Ustic Torripsamments
Landform: Hills (fig. 331)
Geology: Entrada Formation (Jurassic)
Parent material: Slope alluvium derived from sandstone over residuum weathered from sandstone
Slope: 15 to 45 percent, east to west aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 20 inches; lithic bedrock at a depth of 10 to 40 inches

Figure 331.—The Mident soil in map unit 96 (Sandyranch-Mido-Mident complex, 2 to 45 percent slopes) on hills.

Drainage class: Somewhat excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 1.0 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sand (Utah Juniper-Pinyon)
Ecological site number: R035XY227UT
Present vegetation (in most areas): Utah juniper, galleta, twoneedle pinyon, crispleaf buckwheat, green ephedra, and stemless four-nerve daisy
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	15-25
Litter (<5 mm)	0-5
Rock fragments	30-40
Bare soil	35-45
Cyanobacteria crust	0
Lichen crust	0

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 42893 meters E., 4204638 meters N., zone 12

AC—0 to 1 inch (0 to 2 centimeters); light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; 10 percent clay; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine roots throughout; many very fine irregular pores; 8 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C—1 to 11 inches (2 to 28 centimeters); reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; 8 percent clay; massive; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; common very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Cr—11 to 21 inches (28 to 53 centimeters); weakly cemented fractured sandstone; abrupt smooth boundary.

R—21 to 30.5 inches (53 to 78 centimeters); strongly cemented fractured sandstone.

Range in Characteristics

AC horizon:

Clay content—5 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 5 percent gravel

C horizon:

Clay content—5 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

97—Sandyranch-Radnik-Riverwash complex, 1 to 15 percent slopes

Map Unit Setting

General setting: Areas along Halls Creek
Major land resource area: 35—Colorado Plateau
Elevation: 3,880 to 4,740 feet (1,182 to 1,444 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Sandyranch and similar soils: 45 percent
Radnik and similar soils: 30 percent
Riverwash: 15 percent
Minor components (10 percent) and their ecological sites:
Rock outcrop (Entrada Sandstone)

Figure 332.—Profile of the Sandyranch soil in map unit 97 (Sandyranch-Radnik-Riverwash complex, 1 to 15 percent slopes). Scale is in centimeters.

Very deep, sandy soils on flood plains and flood-plain steps of Halls Creek with Fremont cottonwood, common threesquare, coyote willow, and desert saltgrass; Colorado Plateau Riparian Complex Intermittent (Valley Type IV - F5 Stream Type)

Begay soils on stream terraces (very deep, coarse-loamy soils); Semidesert Sandy Loam (Fourwing Saltbush)

Description of the Sandyranch Soil

Taxonomic classification: Mixed, mesic Ustic Torripsamments (fig. 332)
Landform: Flood-plain steps (fig. 333)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 1 to 15 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 5.0 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A

Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Sandy Bottom (Fourwing Saltbush)
Ecological site number: R035XY015UT
Present vegetation (in most areas): Indian ricegrass, fourwing saltbush, sand sagebrush, and mesa dropseed
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	25-40
Litter (<5 mm)	20-35
Rock fragments	0-5
Bare soil	20-30
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 505292 meters E., 4174747 meters N., zone 12

C1—0 to 2.5 inches (0 to 6 centimeters); yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; 1 percent clay; single grain; loose, nonsticky

Figure 333.—The Sandyranch soil in map unit 97 (Sandyranch-Radnik-Riverwash complex, 1 to 15 percent slopes) on flood-plain steps.

and nonplastic; common fine roots throughout; many very fine interstitial pores; strongly effervescent; moderately alkaline, pH 8.0; abrupt wavy boundary.

C2—2.5 to 5.5 inches (6 to 14 centimeters); brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; 6 percent clay; massive; soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C3—5.5 to 16 inches (14 to 41 centimeters); yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

C4—16 to 71 inches (41 to 180 centimeters); yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; 1 percent clay; single grain; loose, nonsticky and nonplastic; common fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

C horizons:

Hue—7.5YR or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—fine sand or loamy fine sand
Clay content—1 to 8 percent
Calcium carbonate equivalent—1 to 5 percent
SAR—0 to 5
Electrical conductivity—0 to 8 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Radnik Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, calcareous, mesic Ustic Torrifluvents
Landform: Flood-plain steps (fig. 334)
Geology: Quaternary alluvium
Parent material: Alluvium derived from sandstone
Slope: 1 to 4 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 6.2 (moderate)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: Occasional
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very low
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Sandy Loam (Fourwing Saltbush)
Ecological site number: R035XY215UT
Present vegetation (in most areas): James' galleta, Indian ricegrass, mesa dropseed, sand sagebrush, fourwing saltbush, and woolly plantain
Land capability classification (nonirrigated areas): 6c

Figure 334.—Landscape of the Radnik soil in map unit 97 (Sandyranch-Radnik-Riverwash complex, 1 to 15 percent slopes).

Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	10-20
Rock fragments	0-10
Bare soil	5-25
Cyanobacteria crust	15-30
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 508440 meters E., 4166594 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/4) moist; 15 percent clay; moderate thin platy structure; soft, very friable, nonsticky and moderately plastic; common fine and common very fine roots throughout; common very fine interstitial and common very fine irregular pores; strongly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C1—2 to 8.5 inches (5 to 22 centimeters); light brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 5/4) moist; 11 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C2—8.5 to 14 inches (22 to 36 centimeters); light yellowish brown (10YR 6/4) gravelly loamy fine sand, yellowish brown (10YR 5/4) moist; 5 percent clay; massive; soft,

very friable, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; 17 percent gravel; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—14 to 31.5 inches (36 to 80 centimeters); light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; 14 percent clay; massive; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; very slightly effervescent; moderately alkaline, pH 8.2; gradual wavy boundary.

C4—31.5 to 60 inches (80 to 153 centimeters); light yellowish brown (10YR 6/4) gravelly loamy fine sand, yellowish brown (10YR 5/4) moist; 6 percent clay; single grain; loose, nonsticky and nonplastic; many very fine interstitial pores; 25 percent gravel; very slightly effervescent; moderately alkaline, pH 8.0.

Range in Characteristics

A horizon:

Hue—7.5YR or 5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 5 dry; 4 or 6 moist
Texture—silt loam, very fine sandy loam, fine sandy loam, loamy very fine sand, or loamy fine sand
Clay content—5 to 15 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C horizons:

Hue—7.5YR or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 to 5 dry; 4 or 6 moist
Texture—fine sandy loam or loamy fine sand
Clay content—5 to 15 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 25 percent gravel

Description of the Riverwash

This component consists of unstabilized sandy, silty, clayey, or gravelly sediment that is flooded, washed, and reworked frequently by rivers or ephemeral water flows and is usually devoid of vegetation.

98—Seeg-Moffat-Needle complex, 2 to 30 percent slopes

Map Unit Setting

General setting: Areas along Halls Creek
Major land resource area: 35—Colorado Plateau
Elevation: 4,180 to 4,850 feet (1,274 to 1,478 meters)
Mean annual precipitation: 6 to 9 inches (152 to 229 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.1 to 12.7 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.2 to 13.8 degrees C)
Frost-free period: 160 to 180 days

Map Unit Composition

Seeg and similar soils: 40 percent
Moffat and similar soils: 30 percent

Figure 335.—Profile of the Seeg soil in map unit 98 (Seeg-Moffat-Needle complex, 2 to 30 percent slopes). Scale is in centimeters.

Needle and similar soils: 25 percent
Minor components (5 percent) and their ecological sites:
Rock outcrop (Entrada Sandstone)
Very deep, sandy soils on sand sheets on valley sides; Sandy Bottom (Fourwing Saltbush)

Description of the Seeg Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Typic Haplocalcids (fig. 335)
Landform: High stream terraces and strath terraces (fig. 336)
Geology: Terrace gravel deposits and colluvial deposits (Quaternary)
Parent material: Alluvium derived from igneous and sedimentary rock and/or colluvium derived from igneous and sedimentary rock

Figure 336.—The Seeg soil in map unit 98 (Seeg-Moffat-Needle complex, 2 to 30 percent slopes) on stream terraces.

Slope: 6 to 30 percent, southeast to northwest aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 4.8 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Stony Loam (Blackbrush)
Ecological site number: R035XY139UT
Present vegetation (in most areas): Blackbrush, galleta, Bigelow sage, and Torrey's jointfir
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	15-25
Litter (<5 mm)	10-15
Rock fragments	40-55
Bare soil	10-20
Cyanobacteria crust	0-5

Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 505576 meters E., 4175132 meters N., zone 12

A—0 to 3 inches (0 to 7 centimeters); light brown (7.5YR 6/3) loamy sand, brown (7.5YR 5/4) moist; 5 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; 10 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bw—3 to 8 inches (7 to 20 centimeters); yellowish red (5YR 5/6) gravelly sandy loam, yellowish red (5YR 4/6) moist; 12 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common very fine roots throughout; many very fine irregular pores; 20 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Bk—8 to 12 inches (20 to 31 centimeters); yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 5/4) moist; 16 percent clay; moderate coarse subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common very fine roots throughout; many very fine irregular pores; common fine irregular carbonate masses in matrix; 5 percent gravel; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

C—12 to 71 inches (31 to 180 centimeters); reddish brown (5YR 5/4) very gravelly sandy loam, reddish brown (5YR 4/4) moist; 11 percent clay; massive; moderately hard, firm, slightly sticky and nonplastic; common very fine roots throughout; many very fine irregular pores; 50 percent gravel; strongly effervescent; moderately alkaline, pH 8.2.

Range in Characteristics

A horizon:

Value—5 or 6 dry; 4 or 5 moist
Chroma—3 or 4, dry or moist
Texture—loamy sand, sandy loam, or fine sandy loam
Clay content—4 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—10 to 50 percent gravel and cobbles

Bw horizon:

Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—15 to 40 percent gravel and cobbles

Bk horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Rock fragments—5 to 60 percent gravel and cobbles

C horizon:

Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist

Figure 337.—Profile of the Moffat soil in map unit 98 (Seeg-Moffat-Needle complex, 2 to 30 percent slopes). Scale is in centimeters.

Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—35 to 50 percent gravel and cobbles

Description of the Moffat Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Haplocalcids (fig. 337)
Landform: High terraces, hills, stream terraces, and strath terraces (fig. 338)
Geology: Eolian and alluvial deposits (Quaternary)
Parent material: Eolian sands derived from sandstone

Slope: 2 to 30 percent, north to northwest aspects
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 4.5 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 3 SAR (slightly sodic)
Ecological site name: Desert Sandy Loam (Blackbrush)
Ecological site number: R035XY121UT
Present vegetation (in most areas): Blackbrush, Cutler's jointfir, and plains pricklypear
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	15-25
Litter (<5 mm)	5-15
Rock fragments	0
Bare soil	30-40
Cyanobacteria crust	25-35
Lichen crust	0

Figure 338.—The Moffat soil in map unit 98 (Seeg-Moffat-Needle complex, 2 to 30 percent slopes) on stream terraces.

Moss crust	0-5
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 504180 meters E., 4176818 meters N., zone 12

A—0 to 5 inches (0 to 13 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 4 percent clay; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 1 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

BA—5 to 8.5 inches (13 to 22 centimeters); yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; 7 percent clay; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 1 percent gravel; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk1—8.5 to 15.5 inches (22 to 40 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 11 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common fine and common medium roots throughout; many very fine irregular pores; common fine irregular carbonate masses in matrix; 5 percent gravel; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk2—15.5 to 29.5 inches (40 to 75 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 12 percent clay; moderate medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common fine roots throughout; many very fine irregular pores; common fine irregular carbonate masses in matrix; 10 percent gravel; violently effervescent; strongly alkaline, pH 8.6; clear wavy boundary.

Bk3—29.5 to 39.5 inches (75 to 100 centimeters); yellowish red (5YR 5/6) gravelly fine sandy loam, yellowish red (5YR 4/6) moist; 12 percent clay; weak medium subangular blocky structure; moderately hard, firm, slightly sticky and nonplastic; common fine roots throughout; many very fine irregular pores; common fine irregular carbonate masses in matrix; 20 percent gravel; strongly effervescent; strongly alkaline, pH 8.6.

Range in Characteristics

Note: Some pedons have clay loam textures in the Bw and Bk horizons

A horizon:

Hue—5YR or 7.5YR
Value—4 to 6, dry or moist
Chroma—4 or 6, dry or moist
Texture—loamy fine sand or fine sand
Clay content—4 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 15 percent gravel

BA horizon:

Hue—5YR or 7.5YR
Clay content—5 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 15 percent gravel

Bk horizons:
Hue—5YR or 7.5YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 to 6, dry or moist
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Rock fragments—0 to 15 percent gravel and cobbles
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

C horizons (if they occur):
Value—5 or 6 dry; 4 or 5 moist
Chroma—3 to 6, dry or moist
Texture—loamy fine sand or fine sand
Clay content—4 to 10 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 20 percent gravel and cobbles

Description of the Needle Soil

Taxonomic classification: Mixed, mesic Lithic Torripsamments (fig. 339)
Landform: Structural benches
Geology: Eolian deposits (Quaternary) and Entrada Sandstone (Jurassic)
Parent material: Eolian deposits derived from sandstone and/or residuum weathered from sandstone
Slope: 2 to 15 percent, east to northwest aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 2 to 20 inches

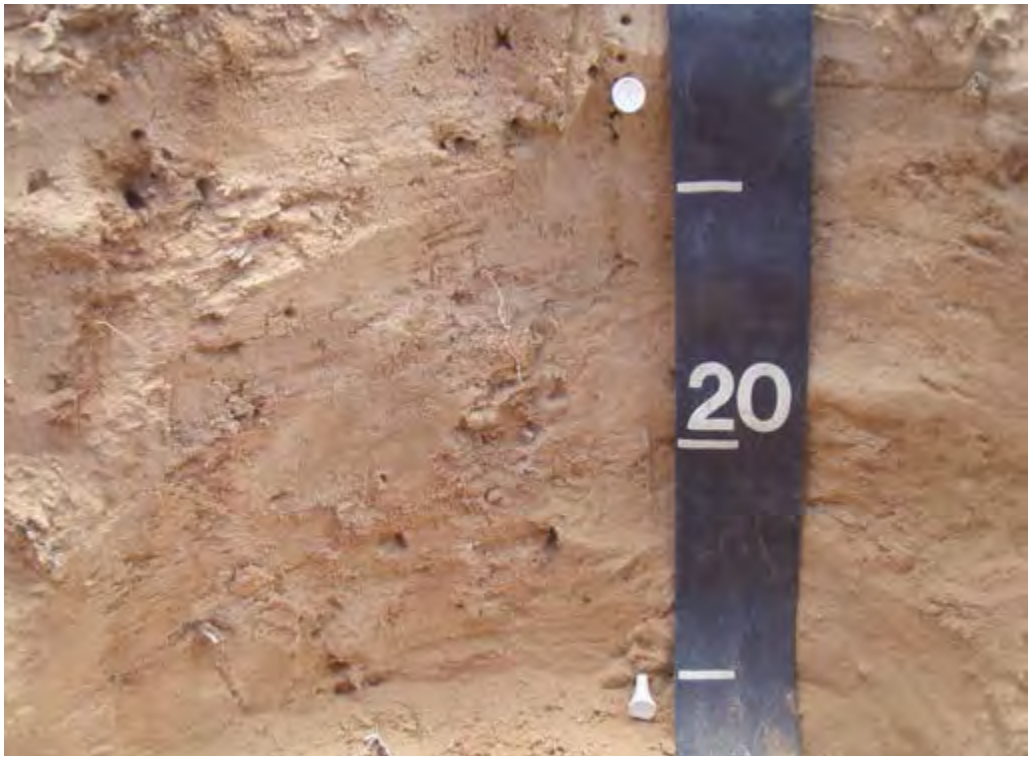

Figure 339.—Profile of the Needle soil in map unit 98 (Seeg-Moffat-Needle complex, 2 to 30 percent slopes). Sandstone bedrock is at a depth of 30 centimeters. Scale is in centimeters.

Drainage class: Excessively drained
Slowest permeability: 6.0 to 20 in/hr (rapid)
Available water capacity (total inches): About 0.6 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Desert Shallow Sandy Loam (Blackbrush)
Ecological site number: R035XY133UT
Present vegetation (in most areas): Blackbrush, galleta, needle and thread, and specklepod milkvetch
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	5-15
Rock fragments	15-25
Bare soil	30-40
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 507467 meters E., 4168389 meters N., zone 12

C1—0 to 2.5 inches (0 to 6 centimeters); yellowish red (5YR 5/6) fine sand, yellowish red (5YR 4/6) moist; 4 percent clay; weak medium platy structure; soft, very friable, nonsticky and nonplastic; common very fine roots throughout; many very fine interstitial pores; 2 percent gravel; slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

2C2—2.5 to 12 inches (6 to 30 centimeters); yellowish red (5YR 5/6) paraflaggy fine sand, yellowish red (5YR 4/6) moist; 4 percent clay; massive; soft, very friable, nonsticky and nonplastic; few fine and few very fine roots throughout; many very fine interstitial pores; 10 percent parachanners and 20 percent paraflagstones; strongly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

2R—12 to 21.5 inches (30 to 55 centimeters); very strongly cemented sandstone; common medium roots at top of horizon.

Range in Characteristics

C1 horizon:
Hue—7.5YR or 5YR
Chroma—4 or 6, dry or moist
Texture—loamy fine sand or fine sand
Clay content—2 to 5 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 15 percent gravel

Figure 340.—Landscape of map unit 99 (Simel-Catahoula-Rock outcrop complex, 30 to 70 percent slopes, saline). This map unit is on escarpments east of Scenic Drive.

C2 or 2C2 horizon:
Hue—7.5YR or 5YR
Chroma—4 or 6, dry or moist
Texture—loamy fine sand or fine sand
Clay content—2 to 5 percent
Calcium carbonate equivalent—1 to 5 percent
Rock fragments—0 to 15 percent gravel and 0 to 30 percent parachanners or paraflagstones

99—Simel-Catahoula-Rock outcrop complex, 30 to 70 percent slopes, saline

Map Unit Setting

General setting: West-facing escarpments along Scenic Drive (fig. 340)
Major land resource area: 35—Colorado Plateau
Elevation: 5,380 to 7,340 feet (1,639 to 2,236 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Simel, saline and similar soils: 40 percent
Catahoula, saline and similar soils: 25 percent

Rock outcrop, Moenkopi, Chinle, Wingate, and Kayenta Formations: 20 percent
Minor components (15 percent) and their ecological sites:
- Reef soils on escarpments and structural benches (shallow, loamy-skeletal soils); Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
- Emco family soils on hills in the Chinle Formation (shallow, clayey soils); Desert Shallow Clay (Shadscale)
- Clapper soils on escarpments (deep, loamy-skeletal soils); Semidesert Very Steep Stony Loam (Salina Wildrye)
- Badland and Rubbleland with no vegetation

Description of the Simel, Saline Soil

Note: A saline phase and a desert ecological site are assigned to this ustic aridic soil because the high electrical conductivity of the soil reduces the amount of water available for uptake by plant roots.

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 341)
Landform: Escarpments (fig. 342)
Geology: Moenkopi and Chinle Formations (Triassic)
Parent material: Residuum weathered from shale
Slope: 30 to 70 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 20 inches; lithic bedrock at a depth of 15 to 30 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 2.1 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 30 mmhos/cm (strongly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Desert Shallow Loam (Shadscale)
Ecological site number: R035XY122UT
Present vegetation (in most areas): Crispleaf buckwheat, Torrey's jointfir, galleta, shadscale, and pinyon
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	10-15
Litter (<5 mm)	0-5
Rock fragments	2-20
Bare soil	65-85
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479155 meters E., 4234878 meters N., zone 12

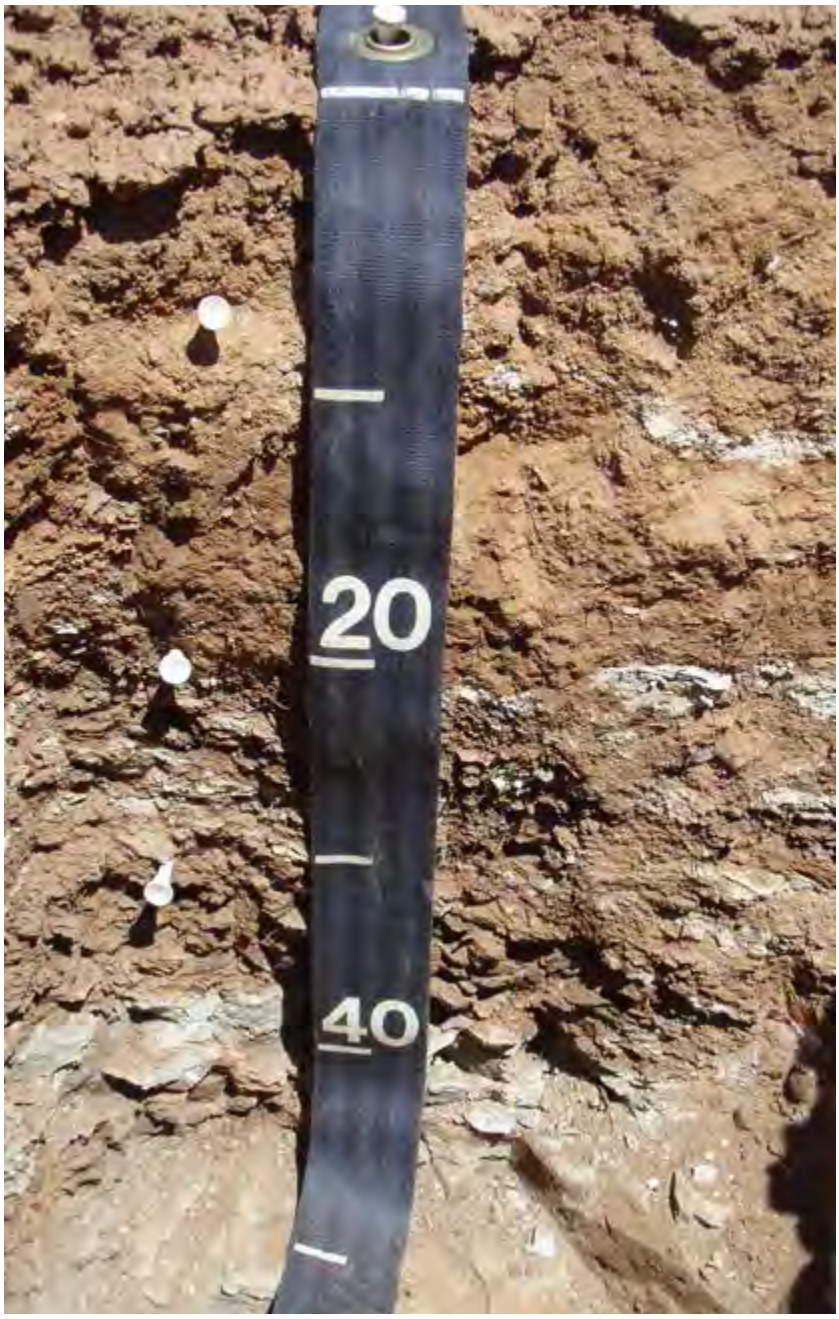

Figure 341.—Profile of the Simel soil in map unit 99 (Simel-Catahoula-Rock outcrop complex, 30 to 70 percent slopes, saline). Soft bedrock is at a depth of 30 centimeters; hard bedrock is at a depth of 45 inches. Scale is in centimeters.

C1—0 to 2.5 inches (0 to 6 centimeters); reddish brown (5YR 4/4) silt loam, dark reddish brown (5YR 3/4) moist; 25 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; few fine roots throughout; many very fine irregular pores; 5 percent channers; slightly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

C2—2.5 to 8 inches (6 to 20 centimeters); reddish brown (5YR 4/4) silty clay loam, dark reddish brown (5YR 3/4) moist; 30 percent clay; massive; slightly hard,

Figure 342.—The Simel soil in map unit 99 (Simel-Catahoula-Rock outcrop complex, 30 to 70 percent slopes, saline) on escarpments.

friable, moderately sticky and moderately plastic; common fine and common very fine roots throughout; many very fine irregular pores; 2 percent channers; very slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Cy—8 to 12 inches (20 to 30 centimeters); reddish brown (5YR 4/4) parachannery silty clay loam, dark reddish brown (5YR 3/4) moist; 30 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; common fine and common very fine roots throughout; many very fine irregular pores; common coarse irregular gypsum masses in matrix; 30 percent parachanners; very slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

Cr—12 to 17.5 inches (30 to 45 centimeters); moderately cemented shale; abrupt wavy boundary.

R—17.5 to 27.5 inches (45 to 70 centimeters); very strongly cemented shale.

Range in Characteristics

Note: Some pedons are more yellow than is allowed in the Simel series

C horizons:

Value—4 to 6 dry; 3 to 5 moist
Texture—very fine sandy loam, silt loam, or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—1 to 5 percent
SAR—0 to 5
Electrical conductivity—8 to 16 mmhos/cm
Rock fragments—0 to 30 percent gravel and 0 to 15 percent parachanners
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Cy horizon:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—fine sandy loam, sandy clay loam, or silty clay loam
Clay content—18 to 35 percent
Calcium carbonate equivalent—1 to 5 percent
Gypsum content—1 to 5 percent
SAR—0 to 5
Electrical conductivity—16 to 30 mmhos/cm
Rock fragments—0 to 20 percent gravel and 0 to 30 percent parachanners
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

Description of the Catahoula, Saline Soil

Note: A saline phase and a desert ecological site are assigned to this ustic aridic soil because the electrical conductivity of the soil reduces the amount of water available for uptake by plant roots.

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocambids (fig. 343)
Landform: Escarpments (fig. 344)
Geology: Chinle Formation and Wingate Sandstone (Triassic and Jurassic)
Parent material: Colluvium derived from sandstone
Slope: 30 to 60 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 3.3 (low)
Shrink-swell potential: About 0.0 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 3 percent
Salinity maximum: About 8 mmhos/cm (slightly saline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Desert Very Steep Stony Loam (Shadscale)
Ecological site number: R035XY146UT
Present vegetation (in most areas): Shadscale saltbush, galleta, crispleaf buckwheat, Indian ricegrass, and broom snakeweed
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	5-10
Litter (<5 mm)	0-5
Rock fragments	50-70
Bare soil	30-40
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Figure 343.—Profile of the Catahoula soil in map unit 99 (Simel-Catahoula-Rock outcrop complex, 30 to 70 percent slopes, saline). Scale is in centimeters.

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 479200 meters E., 4234796 meters N., zone 12

A—0 to 4 inches (0 to 10 centimeters); strong brown (7.5YR 5/6) gravelly sandy loam, strong brown (7.5YR 4/6) moist; 16 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; common very fine irregular pores; 2 percent gravel and 30 percent cobbles; slightly effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bw—4 to 17.5 inches (10 to 44 centimeters); light brown (7.5YR 6/4) very gravelly sandy loam, strong brown (7.5YR 5/6) moist; 14 percent clay; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; common very fine irregular

and common fine tubular pores; 45 percent gravel and 5 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

BC—17.5 to 21.5 inches (44 to 54 centimeters); reddish yellow (5YR 6/6) gravelly sandy loam, yellowish red (5YR 4/6) moist; 11 percent clay; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; common very fine irregular pores; 10 percent gravel and 5 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

C—21.5 to 80 inches (54 to 203 centimeters); very pale brown (10YR 7/4) very gravelly loamy sand, light brown (7.5YR 6/4) moist; 6 percent clay; single grain; loose, nonsticky and nonplastic; common fine roots throughout; common very fine irregular pores; 45 percent gravel and 10 percent cobbles; very slightly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

A horizon:

Clay content—10 to 18 percent
Calcium carbonate equivalent—0 to 3 percent
Gypsum content—0 to 5 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 35 percent gravel and cobbles

Bw horizon:

Clay content—10 to 18 percent
Calcium carbonate equivalent—0 to 3 percent

Figure 344.—The Catahoula soil in map unit 99 (Simel-Catahoula-Rock outcrop complex, 30 to 70 percent slopes, saline) in colluvium on escarpments.

Gypsum content—0 to 5 percent
Electrical conductivity—2 to 4 mmhos/cm
Rock fragments—35 to 60 percent gravel and cobbles

BC horizon:
Clay content—10 to 18 percent
Calcium carbonate equivalent—0 to 3 percent
Gypsum content—0 to 5 percent
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—15 to 40 percent gravel and cobbles

C horizon:
Hue—2.5YR to 10YR
Value—3 to 6, dry or moist
Chroma—3 or 4, dry or moist
Texture—fine sandy loam, sandy loam, or loamy sand
Clay content—5 to 18 percent
Calcium carbonate equivalent—0 to 3 percent
Gypsum content—0 to 5 percent
SAR—0 to 5
Electrical conductivity—4 to 8 mmhos/cm
Rock fragments—35 to 60 percent gravel, cobbles, and channers
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Catahoula soil is considered a taxadjunct to the Catahoula series because it contains a cambic horizon and is classified as an Ustic Haplocambid whereas the Catahoula series is classified as an Ustic Torriorthent.

Description of the Rock Outcrop, Moenkopi, Chinle, Wingate, and Kayenta Formations

This component is characterized by very tall, nearly continuous, nearly vertical cliffs and escarpments. The lithology is sandstone. The vertical relief ranges from several tens to several hundreds of feet. Travel by any type of wheeled vehicle is virtually impossible. Travel by foot is extremely difficult or nearly impossible and is usually hazardous. This component is a natural barrier to livestock and most other terrestrial animals. The nearly vertical areas are barren but there may be vegetation growing in cracks and crevices or in areas of colluvial deposition.

100—Simel-Rock outcrop complex, 20 to 50 percent slopes

Map Unit Setting

General setting: Scenic Drive and the area between Meeks Mesa and Highway 24 (fig. 345)
Major land resource area: 35—Colorado Plateau
Elevation: 5,510 to 6,990 feet (1,680 to 2,130 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Simel and similar soils: 40 percent
Rock outcrop, Moenkopi and Chinle Formations: 35 percent

Figure 345.—Landscape of map unit 100 (Simel-Rock outcrop complex, 20 to 50 percent slopes). This map unit is on dissected structural benches.

Minor components (25 percent) and their ecological sites:

Mido soils on sand sheets on mesas (very deep, sandy soils); Semidesert Sand (Fourwing Saltbush)

Catahoula soils on talus slopes and escarpments (moderately deep, loamy-skeletal soils); Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)

Description of the Simel Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 346)
Landform: Structural benches
Geology: Moenkopi and Chinle Formations
Parent material: Residuum weathered from siltstone
Slope: 20 to 50 percent, northeast to northwest aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 1.1 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 5 percent

Figure 346.—Profile of the Simel soil in map unit 100 (Simel-Rock outcrop complex, 20 to 50 percent slopes). Bedrock is at a depth of 39 centimeters. Scale is in centimeters.

Salinity maximum: About 4 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Sandy Loam (Shadscale)
Ecological site number: R035XY230UT
Present vegetation (in most areas): Galleta, crispleaf buckwheat, Torrey's jointfir, shadscale, Douglas rabbitbrush, and Utah juniper
Land capability classification (nonirrigated areas): 7e
Ground cover (percent): (fig. 347)

Plant canopy	15-25
Litter (<5 mm)	0-10
Rock fragments	20-40
Bare soil	40-60

Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 469568 meters E., 4242541 meters N., zone 12

A—0 to 3.5 inches (0 to 9 centimeters); red (2.5YR 5/6) silt loam, red (2.5YR 4/6) moist; 23 percent clay; moderate very fine granular and weak coarse subangular blocky structure; slightly hard, friable, moderately sticky and moderately plastic; few fine roots throughout; many very fine irregular pores; 10 percent channers; slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C1—3.5 to 8.5 inches (9 to 22 centimeters); reddish brown (2.5YR 4/4) extremely parachannery silt loam, dark reddish brown (2.5YR 3/4) moist; 25 percent clay; massive; moderately sticky and moderately plastic; few very fine, common fine, and common medium roots throughout; common very fine and common fine irregular pores; 65 percent parachanners; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

C2—8.5 to 15.5 inches (22 to 39 centimeters); reddish brown (2.5YR 4/4) parachanners, dark reddish brown (2.5YR 3/4) moist; 25 percent clay; massive; few fine and few medium roots throughout; common fine irregular pores; 95

Figure 347.—Typical surface of the Simel soil in map unit 100 (Simel-Rock outcrop complex, 20 to 50 percent slopes).

percent parachanners; very slightly effervescent; slightly alkaline, pH 7.8; gradual smooth boundary.

Cr—15.5 to 25 inches (39 to 64 centimeters); weakly cemented, fractured sandstone and siltstone.

Range in Characteristics

A horizon:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Clay content—20 to 27 percent
Calcium carbonate equivalent—1 to 5 percent
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—10 to 15 percent channers or flagstones
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C1 horizon:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Clay content—20 to 27 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—50 to 70 percent parachanners or paragravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C2 horizon:
Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 4 mmhos/cm
Rock fragments—90 to 95 percent parachanners or paragravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

Description of the Rock Outcrop, Moenkopi and Chinle Formations

This component is characterized by many cliffs and escarpments. The lithology is sandstone. The vertical relief is commonly less than a few feet but the continuity of cliffs and escarpments is nearly continuous. Typically, the vertical relief and continuity of cliffs make travel by full-sized four-wheeled vehicles nearly impossible. The impediment to foot travel or to animals is usually only slight to moderate. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

101—Simel-Simel, steep-Rock outcrop complex, 15 to 60 percent slopes

Map Unit Setting

General setting: Flanks of Miners Mountain (fig. 348)
Major land resource area: 35—Colorado Plateau
Elevation: 5,450 to 8,220 feet (1,662 to 2,507 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)

Figure 348.—Landscape of map unit 101 (Simel-Simel, steep-Rock outcrop complex, 15 to 60 percent slopes) on mountain slopes.

Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Simel and similar soils: 50 percent
Simel, steep and similar soils: 25 percent
Rock outcrop, Moenkopi Formation sandstone: 15 percent
Minor components (10 percent) and their ecological sites:
- Shallow soils on mountain slopes with less than 18 percent clay; Semidesert Shallow Loam (Utah Juniper-Pinyon)
- Rubbleland on mountain slopes with no vegetation
- Shallow soils on canyon side slopes with more than 35 percent hard rock fragments throughout; Semidesert Shallow Loam (Utah Juniper-Pinyon)

Description of the Simel Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 349)
Landform: Mountain slopes
Geology: Moenkopi Formation (Triassic)
Parent material: Slope alluvium derived from sandstone over residuum weathered from sandstone
Slope: 15 to 30 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 15 inches; lithic bedrock at a depth of 10 to 20 inches
Drainage class: Well drained

Figure 349.—Profile of the Simel soil in map unit 101 (Simel-Simel, steep-Rock outcrop complex, 15 to 60 percent slopes). Bedrock is at a depth of 28 centimeters. Scale is in centimeters.

Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 0.9 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, broom snakeweed, galleta, and roundleaf buffaloberry
Land capability classification (nonirrigated areas): 7e
Ground cover (percent):

Plant canopy	20-25
Litter (<5 mm)	5-15
Rock fragments	50-60
Bare soil	5-15
Cyanobacteria crust	0-5
Lichen crust	0

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 478616 meters E., 4234959 meters N., zone 12

C1—0 to 3 inches (0 to 7 centimeters); reddish brown (2.5YR 4/4) channery silt loam, dark reddish brown (2.5YR 3/4) moist; 26 percent clay; moderate thick platy structure; slightly hard, friable, moderately sticky and moderately plastic; many fine vesicular pores; 15 percent channers and 5 percent parachanners; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

C2—3 to 7 inches (7 to 18 centimeters); reddish brown (2.5YR 4/4) extremely parachannery silt loam, dark reddish brown (2.5YR 3/4) moist; 25 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; few fine and few very fine roots throughout; common very fine irregular pores; 70 percent parachanners; very slightly effervescent; moderately alkaline, pH 8.2; clear smooth boundary.

C3—7 to 11 inches (18 to 28 centimeters); reddish brown (2.5YR 4/4) extremely parachannery silt loam, dark reddish brown (2.5YR 3/4) moist; 24 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; few fine and few very fine roots throughout; common very fine irregular pores; 80 percent parachanners; very slightly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Cr—11 to 14 inches (28 to 35 centimeters); moderately cemented sandstone; very abrupt smooth boundary.

R—14 to 23.5 inches (35 to 60 centimeters); indurated sandstone.

Range in Characteristics

A or surface C horizon:

Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—loam, silt loam, or fine sandy loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—15 to 50 percent channers or flagstones and 0 to 10 percent parachanners

Subsurface C horizons:

Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—silt loam or silty clay loam
Clay content—20 to 35 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—0 to 20 percent channers or flagstones and 20 to 80 percent parachanners

Description of the Simel, Steep Soil

Note: A steep phase is assigned to this soil because it has slopes ranging to 60 percent and is in a steep ecological site.

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 350)

Figure 350.—Profile of the Simel, steep soil in map unit 101 (Simel-Simel, steep-Rock outcrop complex, 15 to 60 percent slopes). Bedrock is at a depth of 39 centimeters. Scale is in inches.

Landform: Mountain slopes
Geology: Moenkopi Formation (Triassic)
Parent material: Slope alluvium derived from sandstone over residuum weathered from sandstone
Slope: 30 to 60 percent, north aspect
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 15 inches; lithic bedrock at a depth of 10 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 1.0 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)

Ecological site number: R035XY240UT
Present vegetation (in most areas): Twoneedle pinyon, Utah juniper, roundleaf buffaloberry, broom snakeweed, and galleta
Land capability classification (nonirrigated areas): 7e
Ground cover (percent): (fig. 351)

Plant canopy	15-25
Litter (<5 mm)	2-10
Rock fragments	55-65
Bare soil	5-10
Cyanobacteria crust	0-5
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 478642 meters E., 4234896 meters N., zone 12

C1—0 to 2 inches (0 to 5 centimeters); yellowish red (5YR 4/6) very channery loam, dark reddish brown (5YR 3/4) moist; 22 percent clay; weak thick platy structure; soft, very friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; many fine vesicular pores; 50 percent channers and 5 percent flagstones; slightly effervescent; moderately alkaline, pH 8.2; abrupt smooth boundary.

Figure 351.—Typical surface of the Simel, steep soil in map unit 101 (Simel-Simel, steep-Rock outcrop complex, 15 to 60 percent slopes).

C2—2 to 11 inches (5 to 28 centimeters); reddish brown (2.5YR 4/4) very parachannery silty clay loam, dark reddish brown (2.5YR 3/4) moist; 34 percent clay; massive; slightly hard, friable, moderately sticky and moderately plastic; few fine roots throughout, common medium roots at top of horizon, and common very coarse roots throughout; common very fine irregular pores; 50 percent parachanners; slightly effervescent; moderately alkaline, pH 8.4; clear smooth boundary.

Cr—11 to 15.5 inches (28 to 39 centimeters); moderately cemented sandstone; common medium roots at top of horizon; clear wavy boundary.

R—15.5 to 25 inches (39 to 64 centimeters); indurated sandstone.

Range in Characteristics

Surface C horizon:

Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—loam, silt loam, or fine sandy loam
Clay content—18 to 27 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—15 to 60 percent channers or flagstones and 0 to 15 percent parachanners

Subsurface C horizon:

Hue—2.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—4 or 6, dry or moist
Texture—silt loam or silty clay loam
Clay content—20 to 35 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—0 to 20 percent channers or flagstones and 35 to 80 percent parachanners

Description of the Rock Outcrop, Moenkopi Formation Sandstone

This component is characterized by nearly level to strongly sloping rock outcrop with discontinuous cliffs and escarpments. The lithology is sandstone. The vertical relief is commonly a few feet, and the continuity of the cliffs is broken. Typically, there are enough cliffs to impede vehicular travel to some degree. The area can be negotiated by full-sized four-wheeled vehicles with difficulty. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface. Portions of this rock outcrop include potholes in which water may pond for brief periods after rain.

102—Skos-Badland complex, 25 to 60 percent slopes

Map Unit Setting

General setting: Areas adjacent to Grand Staircase-Escalante National Monument and the escarpment below Wagon Box Mesa
Major land resource area: 35—Colorado Plateau
Elevation: 5,200 to 7,200 feet (1,585 to 2,195 meters)
Mean annual precipitation: 9 to 12 inches (229 to 305 millimeters)
Mean annual air temperature: 45 to 52 degrees F (7.0 to 11.0 degrees C)
Mean annual soil temperature: 47 to 54 degrees F (8.1 to 12.1 degrees C)
Frost-free period: 120 to 160 days

Map Unit Composition

Skos and similar soils: 60 percent
Badland, Moenkopi Formation: 35 percent
Minor components (15 percent):
Moderately deep or deep, loamy-skeletal soils on escarpments (semidesert, mesic)

Description of the Skos Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Escarpments on structural benches
Geology: Moenkopi Formation sandstone (Triassic)
Parent material: Residuum and colluvium derived from sandstone and shale
Slope: 25 to 60 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 1.3 (very low)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 20 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Shale (Utah Juniper-Pinyon)
Ecological site number: R035XY234UT
Present vegetation (in most areas): Fremont's mahonia, Utah juniper, broom snakeweed, galleta, green Mormon tea, Indian ricegrass, Mexican cliffrose, other shrubs, plains pricklypear, twoneedle pinyon, and yellow rabbitbrush
Land capability classification (nonirrigated areas): 7s

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 460631 meters E., 4137799 meters N., zone 12

A—0 to 2 inches (0 to 5 centimeters); light reddish brown (5YR 6/4) very channery loam, reddish brown (5YR 4/3) moist; 18 percent clay; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine, few fine, and few medium roots; many very fine interstitial pores; 15 percent gravel, 10 percent cobbles, 15 percent channers, and 5 percent flagstones; slightly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

AC—2 to 6.5 inches (5 to 17 centimeters); reddish brown (5YR 5/4) very flaggy silt loam, reddish brown (5YR 4/4) moist; 19 percent clay; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; few very fine, few fine, and few medium roots; many very fine interstitial pores; 10 percent gravel, 10 percent cobbles, 15 percent channers, and 10 percent flagstones; strongly effervescent; moderately alkaline, pH 8.0; gradual wavy boundary.

C—6.5 to 13.5 inches (17 to 34 centimeters); light reddish brown (5YR 6/3) very channery silt loam, reddish brown (5YR 5/4) moist; 17 percent clay; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; few fine and few very fine roots; many very fine interstitial pores; 15 percent gravel, 10 percent

cobbles, 15 percent channers, and 5 percent flagstones; strongly effervescent; moderately alkaline, pH 8.0; clear wavy boundary.

R—13.5 inches (34 centimeters); indurated sandstone.

Range in Characteristics

Clay content: 18 to 27 percent
Rock fragments: 35 to 75 percent channers, gravel, cobbles, and flagstones

A horizon:
Hue—2.5YR, 5YR, or 7.5YR
Value—4 to 6 dry; 3 or 4 moist
Chroma—3 to 6, dry or moist

C horizons:
Hue—2.5YR, 5YR, or 7.5YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—3 to 6, dry or moist
Texture—loam or silt loam
Rock fragments—5 to 80 percent gravel, 10 to 50 percent channers, 0 to 15 percent cobbles, and 0 to 15 percent flagstones

Description of the Badland, Moenkopi Formation

This component consist of areas of steep, barren exposures of shale or mudstone, usually devoid of vegetation, that are dissected by many intermittent drainage channels. Shallow gullies and severe rilling of the surface are common.

103—Strych gravelly very fine sandy loam, 2 to 40 percent slopes

Map Unit Setting

General setting: Upper Cathedral Valley (fig. 352)
Major land resource area: 35—Colorado Plateau
Elevation: 5,430 to 7,210 feet (1,656 to 2,197 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Strych and similar soils: 85 percent
Minor components (15 percent) and their ecological sites:
Soils less than 40 inches deep to bedrock; Semidesert Stony Loam (Utah Juniper-Pinyon)
Begay soils (very deep, coarse-loamy soils with cambic horizons on plateaus); Semidesert Sandy Loam (Fourwing Saltbush)
Soils with gypsum accumulations; Semidesert Gypsum (Torreys Jointfir)

Description of the Strych Soil

Taxonomic classification: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids (fig. 353)
Landform: Pediments and plateaus
Geology: Pediment deposits (Pleistocene and Upper Pliocene)
Parent material: Alluvium derived from basalt
Slope: 2 to 40 percent, northwest to east aspects

Figure 352.—Landscape of map unit 103 (Strych gravelly very fine sandy loam, 2 to 40 percent slopes). This map unit is on pediments and plateaus.

Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 3.0 (low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Medium
Hydrologic group: A
Calcium carbonate content (maximum): About 45 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Stony Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY246UT
Present vegetation (in most areas): Utah juniper, needle and thread, galleta, blue grama, twoneedle pinyon, and roughseed cryptantha
Land capability classification (nonirrigated areas): 7s
Ground cover (percent): (fig. 354)

Plant canopy	25-30
Litter (<5 mm)	5-10
Rock fragments	10-15
Bare soil	40-50
Cyanobacteria crust	0
Lichen crust	0

Figure 353.—Profile of the Strych soil in map unit 103 (Strych gravelly very fine sandy loam, 2 to 40 percent slopes). Scale is in centimeters.

Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 468,372 meters E., 4258,211 meters N., zone 12

A—0 to 3 inches (0 to 7 centimeters); reddish brown (5YR 5/4) gravelly very fine sandy loam, reddish brown (5YR 4/4) moist; 15 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; many very fine irregular pores; 15 percent

gravel and 5 percent cobbles; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

Bk1—3 to 9 inches (7 to 23 centimeters); brown (7.5YR 5/4) very gravelly fine sandy loam, brown (7.5YR 4/4) moist; 16 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine, common fine, and common medium roots throughout; many very fine irregular pores; many medium irregular carbonate masses on bottom of rock fragments; 30 percent gravel, 15 percent cobbles, and 5 percent stones; strongly effervescent; moderately alkaline, pH 8.2; clear wavy boundary.

Bk2—9 to 15.5 inches (23 to 40 centimeters); light brown (7.5YR 6/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; 16 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout and common medium and common coarse roots at top of horizon; many very fine irregular pores; many medium irregular carbonate masses on bottom of rock fragments and common medium irregular carbonate masses in matrix; 30 percent gravel, 10 percent cobbles, and 5 percent stones; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

Bk3—15.5 to 35 inches (40 to 89 centimeters); pinkish gray (7.5YR 7/2) extremely stony fine sandy loam, light brown (7.5YR 6/3) moist; 17 percent clay; weak medium subangular blocky structure; slightly hard, friable, moderately sticky and slightly plastic; common fine roots throughout and common medium roots at top of horizon; common fine irregular pores; very few patchy distinct silica coats on bottom surfaces of rock fragments; many coarse irregular carbonate masses in matrix and many coarse irregular carbonate masses on bottom of rock fragments; 20 percent gravel, 20 percent cobbles, and 35 percent stones; violently effervescent; moderately alkaline, pH 8.4; clear wavy boundary.

CBk—35 to 78.5 inches (89 to 200 centimeters); light brown (7.5YR 6/3) extremely cobbly sandy loam, brown (7.5YR 5/3) moist; 15 percent clay; massive; slightly

Figure 354.—Typical surface of the Strych soil in map unit 103 (Strych gravelly very fine sandy loam, 2 to 40 percent slopes).

hard, friable, slightly sticky and slightly plastic; common fine roots throughout; common fine irregular pores; many fine irregular carbonate masses on bottom of rock fragments and common coarse irregular carbonate masses in matrix; 40 percent gravel, 20 percent cobbles, and 20 percent stones; strongly effervescent; moderately alkaline, pH 8.4.

Range in Characteristics

Clay content in the particle-size control section: Average of less than 18 percent
Calcium carbonate content in the particle-size control section: Average of less than 40 percent
Note: Some profiles may have a Bw horizon below the A horizon

A horizon:
Hue—7.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—sandy loam, fine sandy loam, very fine sandy loam, or loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—1 to 15 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 45 percent gravel, cobbles, and stones

Upper Bk horizons (above a depth of 40 centimeters):
Hue—7.5YR or 10YR
Value—5 to 7 dry; 4 or 5 moist
Chroma—2 to 4 dry; 3 or 4 moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 25 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—15 to 70 percent gravel, cobbles, and stones

Lower Bk horizons (below a depth of 40 centimeters):
Hue—7.5YR or 10YR
Value—6 to 8 dry; 4 to 8 moist
Chroma—1 to 4 dry; 2 to 4 moist
Texture—sandy loam or fine sandy loam
Clay content—10 to 20 percent
Calcium carbonate equivalent—15 to 45 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—35 to 75 percent gravel, cobbles, and stones

CBk horizon:
Chroma—3 or 4, dry or moist
Clay content—10 to 20 percent
Calcium carbonate equivalent—10 to 20 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—50 to 80 percent gravel, cobbles, and stones

104—Sulphurcreek loam, 0 to 5 percent slopes

Map Unit Setting

General setting: Guy Smith, Jackson, Jorgenson, Merin Smith, and Mott orchards and pastures in the Fruita area (fig. 355)
Major land resource area: 35—Colorado Plateau

Figure 355.—The Sulphurcreek soil in map unit 104 (Sulphurcreek loam, 0 to 5 percent slopes) on stream terraces in historic orchards in Fruita.

Elevation: 5,390 to 5,500 feet (1,643 to 1,676 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Sulphurcreek and similar soils: 90 percent
Minor components (10 percent):
Very deep, loamy-skeletal soils on stream terraces and flood-plain steps

Description of the Sulphurcreek Soil

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Ustic Haplargids (fig. 356)
Landform: Stream terraces
Geology: Quaternary alluvium
Parent material: Alluvium derived from basalt and/or alluvium derived from sedimentary rock
Slope: 0 to 5 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.2 to 0.6 in/hr (moderately slow)
Available water capacity (total inches): About 8.4 (high)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: Rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches

Figure 356.—Profile of the Sulphurcreek soil in map unit 104 (Sulphurcreek loam, 0 to 5 percent slopes). The argillic horizon is at a depth of 7 to 30 centimeters. Scale is in centimeters.

Runoff class: Low
Hydrologic group: C
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 3 mmhos/cm (very slightly saline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - C5/F5 Stream Types)
Ecological site number: R035XY022UT
Present vegetation (in most areas): Orchardgrasses and trees
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	20-25

Rock fragments	0
Bare soil	30-40
Cyanobacteria crust	2-4
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 477777 meters E., 4237922 meters N., zone 12

Ap—0 to 3 inches (0 to 7 centimeters); brown (7.5YR 4/4) loam, dark brown (7.5YR 3/3) moist; 24 percent clay; strong fine subangular blocky structure; hard, firm, slightly sticky and moderately plastic; many very fine, common fine, and common medium roots throughout; common very fine dendritic tubular and common very fine irregular pores; very slightly effervescent; slightly alkaline, pH 7.6; clear smooth boundary.

Bt—3 to 12 inches (7 to 30 centimeters); reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; 29 percent clay; strong medium subangular blocky structure; hard, firm, slightly sticky and moderately plastic; common fine and common very fine roots throughout; common very fine irregular, common fine dendritic tubular, and common fine irregular pores; few distinct clay films on vertical faces of peds; very slightly effervescent; slightly alkaline, pH 7.8; gradual wavy boundary.

BC—12 to 17.5 inches (30 to 45 centimeters); yellowish red (5YR 4/6) loam, yellowish red (5YR 4/6) moist; 12 percent clay; weak coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and common very fine roots throughout; common fine irregular pores; very few faint clay films on all faces of peds; very slightly effervescent; slightly alkaline, pH 7.6; gradual wavy boundary.

C1—17.5 to 27 inches (45 to 68 centimeters); yellowish red (5YR 5/6) silty clay loam, reddish brown (5YR 4/4) moist; 25 percent clay; massive; hard, firm, slightly sticky and very plastic; common fine and common very fine roots throughout; common very fine dendritic tubular and common very fine irregular pores; few distinct pressure faces on vertical faces of peds; very slightly effervescent; slightly alkaline, pH 7.6; clear wavy boundary.

C2—27 to 64 inches (68 to 162 centimeters); yellowish red (5YR 4/6) fine sandy loam, yellowish red (5YR 4/6) moist; 6 percent clay; massive; loose, nonsticky and nonplastic; common very fine irregular pores; noneffervescent; slightly alkaline, pH 7.8.

Range in Characteristics

Ap horizon:

Hue—5YR or 7.5YR
Value—3 to 5, dry or moist
Chroma—3 or 4, dry or moist
Texture—loam, silt loam, silty clay loam, or clay loam
Clay content—24 to 30 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 5 percent gravel

Bt horizon:

Value—4 or 5 dry; 3 or 4 moist

Texture—silty clay loam or clay loam
Clay content—28 to 40 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

BC horizon:
Clay content—10 to 25 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

C1 horizon:
Value—4 or 5, dry or moist
Chroma—4 or 6, dry or moist
Texture—fine sandy loam or silt loam
Clay content—6 to 25 percent
Calcium carbonate equivalent—1 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—none

C2 horizon:
Value—4 or 5, dry or moist
Chroma—4 or 6, dry or moist
Texture—loamy fine sand or loam
Clay content—8 to 20 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 25 percent gravel

105—Tesihim-Rizno, steep-Rock outcrop-Badland complex, 6 to 75 percent slopes

Map Unit Setting

General setting: Strike Valley and benches below Tarantula Mesa
Major land resource area: 35—Colorado Plateau
Elevation: 4,920 to 6,370 feet (1,500 to 1,942 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Tesihim and similar soils: 50 percent
Rizno, steep and similar soils: 18 percent
Rock outcrop, Jurassic or Cretaceous sandstones: 18 percent
Badland: 10 percent
Minor components (5 percent) and their ecological sites:
Querencia, saline-sodic soils on toeslopes of scarp slopes (very deep, fine-loamy soils); Desert Loam (Shadscale)
Lybrook, saline-sodic soils on hills (moderately deep, clayey soils); Desert Clay (Castle Valley Saltbush)

Figure 357.—Profile of the Tesihim soil in map unit 105 (Tesihim-Rizno, steep-Rock outcrop-Badland complex, 6 to 75 percent slopes). Weathered sandstone bedrock is at a depth of 25 centimeters. Scale is in centimeters.

Begay, moist soils on hills and dip slopes of cuestas (very deep, coarse-loamy soils with cambic horizons); Semidesert Sandy Loam (Wyoming Big Sagebrush)

Description of the Tesihim Soil

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents (fig. 357)
Landform: Dip slopes of structural benches and hogbacks (fig. 358)
Geology: Mancos, Dakota, Cedar Mountain, Morrison, and Summerville Formations (Cretaceous and Jurassic)
Parent material: Eolian deposits derived from sandstone over residuum weathered from sandstone
Slope: 6 to 35 percent, north to south aspects
Depth to restrictive feature(s): Paralithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.0 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High

Figure 358.—The Tesihim soil in map unit 105 (Tesihim-Rizno, steep-Rock outcrop-Badland complex, 6 to 75 percent slopes) on dip slopes of hogbacks.

Hydrologic group: D
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Semidesert Shallow Loam (Utah Juniper-Pinyon)
Ecological site number: R035XY221UT
Present vegetation (in most areas): Utah juniper, James' galleta, Salina wildrye, and Wyoming big sagebrush
Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	10-20
Litter (<5 mm)	5-15
Rock fragments	15-50
Bare soil	5-20
Cyanobacteria crust	20-50
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 496776 meters E., 4194315 meters N., zone 12

A—0 to 2.5 inches (0 to 6 centimeters); brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; 7 percent clay; weak fine subangular blocky structure; soft, very

friable, nonsticky and nonplastic; few very fine roots throughout; common very fine irregular pores; 1 percent gravel; slightly effervescent; slightly alkaline, pH 7.8; abrupt smooth boundary.

Bw—2.5 to 5.5 inches (6 to 14 centimeters); brown (7.5YR 5/3) fine sandy loam, brown (7.5YR 4/3) moist; 12 percent clay; weak medium subangular blocky structure; very friable, slightly sticky and nonplastic; few fine and few very fine roots throughout; common very fine irregular pores; 1 percent gravel; strongly effervescent; moderately alkaline, pH 8.4; abrupt smooth boundary.

2C—5.5 to 10 inches (14 to 25 centimeters); yellowish brown (10YR 5/4) very paragravelly sandy loam, dark yellowish brown (10YR 4/4) moist; 17 percent clay; massive; friable, slightly sticky and slightly plastic; few very fine and common fine roots throughout and few medium roots at top of horizon; common fine irregular pores; 40 percent paragravel; strongly effervescent; moderately alkaline, pH 8.2; abrupt wavy boundary.

2Cr—10 to 19.5 inches (25 to 50 centimeters); moderately cemented weathered sandstone; few fine roots in cracks.

Range in Characteristics

A horizon:

Hue—2.5Y, 10YR, or 7.5YR
Value—4 to 6 dry; 3 to 6 moist
Chroma—2 to 4, dry or moist
Texture—fine sandy loam, sandy loam, or loamy fine sand
Clay content—7 to 15 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—0 to 15 percent gravel

Bw horizon:

Hue—2.5Y, 10YR, or 7.5YR
Value—4 to 6 dry; 3 to 6 moist
Chroma—2 to 4, dry or moist
Texture—fine sandy loam or sandy loam
Clay content—7 to 15 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—0 to 15 percent gravel
Reaction—slightly alkaline or moderately alkaline (pH 7.4 to 8.4)

C or 2C horizon:

Hue—2.5Y, 10YR, or 7.5YR
Value—5 to 7 dry; 4 to 6 moist
Chroma—3 or 4, dry or moist
Texture—fine sandy loam or sandy loam
Clay content—10 to 15 percent
Calcium carbonate equivalent—1 to 10 percent
Rock fragments—0 to 15 percent gravel and 0 to 40 percent paragravel

This Tesihim soil differs from the Tesihim series in that it has a mean annual soil temperature of 48 to 54 degress F, occurs on slopes ranging to 35 percent, and formed in eolian deposits and residuum weathered from sandstone. The Tesihim series has a mean annual soil temperature of 52 to 55 degrees F, occurs on slopes ranging to 15 percent, and formed from Tertiary tuff.

Description of the Rizno, Steep Soil

Note: A steep phase is assigned to this soil because it has slopes of 35 to 50 percent and is in a steep ecological site.

Figure 359.—The Rizno soil and Rock outcrop in map unit 105 (Tesihim-Rizno, steep-Rock outcrop-Badland complex, 6 to 75 percent slopes) on scarp slopes of hogbacks.

Taxonomic classification: Loamy, mixed, superactive, calcareous, mesic Lithic Ustic Torriorthents
Landform: Scarp slopes of structural benches and hogbacks (fig. 359)
Geology: Mancos, Dakota, Cedar Mountain, Morrison, and Summerville Formations
Parent material: Slope alluvium derived from sandstone over residuum weathered from sandstone
Slope: 35 to 50 percent, east to west aspects
Depth to restrictive feature(s): Lithic bedrock at a depth of 4 to 20 inches
Drainage class: Well drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 0.7 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Very high
Hydrologic group: D
Calcium carbonate content (maximum): About 15 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 5 SAR (slightly sodic)
Ecological site name: Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)
Ecological site number: R035XY240UT
Present vegetation (in most areas): Utah juniper, needle and thread, James' galleta, Salina wildrye, green Mormon tea, roughseed cryptantha, and twoneedle pinyon

Land capability classification (nonirrigated areas): 7s
Ground cover (percent):

Plant canopy	15-30
Litter (<5 mm)	5-20
Rock fragments	25-50
Bare soil	10-30
Cyanobacteria crust	0-20
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 496641 meters E., 4194489 meters N., zone 12

C1—0 to 3.5 inches (0 to 9 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 14 percent clay; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and common very fine roots throughout; common very fine irregular pores; 10 percent gravel; violently effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

C2—3.5 to 6.5 inches (9 to 16 centimeters); light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; 12 percent clay; massive; slightly hard, friable, slightly sticky and nonplastic; common fine roots throughout; common very fine irregular pores; 3 percent channers; violently effervescent; moderately alkaline, pH 8.4; abrupt wavy boundary.

R—6.5 to 16 inches (16 to 41 centimeters); indurated sandstone.

Range in Characteristics

C1 horizon:
Hue—5YR, 7.5YR, or 10YR
Value—5 or 6 dry; 4 or 5 moist
Chroma—4 or 6, dry or moist
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Rock fragments—0 to 10 percent gravel

C2 horizon:
Value—5 to 7 dry; 4 to 6 moist
Clay content—10 to 18 percent
Calcium carbonate equivalent—5 to 15 percent
Rock fragments—0 to 10 percent gravel or channers
Reaction—moderately alkaline or strongly alkaline (pH 7.9 to 9.0)

This Rizno soil differs from the Rizno series in that it has hue of 7.5YR and yellower in the subsurface horizons whereas the Rizno series has hue of 5YR and redder in the C horizon.

Description of the Rock Outcrop, Jurassic or Cretaceous Sandstones

This component is characterized by strongly sloping to nearly vertical rock outcrop. The lithology is sandstone. Typically, there are few nearly vertical cliffs to impede vehicular travel. The vertical relief commonly ranges from a few feet to several feet. Due to the steepness of slopes, the area can be negotiated by full-sized four-wheeled vehicles with care. There are no impediments to foot travel or to animals. The area is typically barren but may have vegetation growing in cracks and crevices or in thin layers of sediment covering the surface.

Figure 360.—Profile of the Tineoyler soil in map unit 106 (Tineoyler loam, 0 to 5 percent slopes). Scale is in centimeters.

Description of the Badland

This component consists of areas of steep, barren exposures of shale, usually devoid of vegetation, that are dissected by many intermittent drainage channels. Shallow gullies and severe rilling of the surface are common.

106—Tineoyler loam, 0 to 5 percent slopes

Map Unit Setting

General setting: Adams, Amsa Pierce, Behunin, Cal Pendleton, Carrell, Cook, Hatties, Holt, Johnson, Max Krueger, and Tine Oyler orchards and pastures in the Fruita area
Major land resource area: 35—Colorado Plateau
Elevation: 5,370 to 5,520 feet (1,636 to 1,683 meters)
Mean annual precipitation: 9 to 13 inches (229 to 330 millimeters)
Mean annual air temperature: 46 to 52 degrees F (7.8 to 11.1 degrees C)
Mean annual soil temperature: 48 to 54 degrees F (8.9 to 12.2 degrees C)
Frost-free period: 140 to 160 days

Map Unit Composition

Tineoyler and similar soils: 90 percent
Minor components (10 percent):
- Very deep, loamy-skeletal soils on stream terraces and flood-plain steps
- Small sandy alluvial fans created by frequent, extremely brief flooding along Wingate Cliffs that deposits sand in run-off areas

Description of the Tineoyler Soil

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Ustifluventic Haplocambids (fig. 360)
Landform: Stream terraces (fig. 361)
Geology: Quaternary alluvium

Parent material: Alluvium derived from basalt and/or alluvium derived from sedimentary rock
Slope: 0 to 5 percent, north aspect
Depth to restrictive feature(s): More than 60 inches
Drainage class: Well drained
Slowest permeability: 0.6 to 2.0 in/hr (moderate)
Available water capacity (total inches): About 9.4 (high)
Shrink-swell potential: About 4.5 LEP (moderate)
Flooding hazard: Rare
Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: Low
Hydrologic group: A
Calcium carbonate content (maximum): About 10 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 0 SAR (nonsodic)
Ecological site name: Colorado Plateau Riparian Complex Perennial (Valley Type IV - C5/F5 Stream Types)
Ecological site number: R035XY022UT
Present vegetation (in most areas): Orchardgrasses and trees
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	30-40
Litter (<5 mm)	20-25
Rock fragments	0

Figure 361.—The Tineoyler soil in map unit 106 (Tineoyler loam, 0 to 5 percent slopes) on stream terraces in the historic orchards of Fruita.

Bare soil	30-40
Cyanobacteria crust	2-4
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 478711 meters E., 4237760 meters N., zone 12

Ap—0 to 4.5 inches (0 to 12 centimeters); brown (7.5YR 4/3) loam, dark brown (7.5YR 3/4) moist; 19 percent clay; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and moderately plastic; many very fine roots throughout; common very fine and common fine irregular pores; 3 percent gravel; very slightly effervescent; slightly alkaline, pH 7.8; clear smooth boundary.

Bw—4.5 to 12.5 inches (12 to 32 centimeters); reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; 17 percent clay; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, common fine, and common medium roots throughout; common fine irregular pores; very slightly effervescent; moderately alkaline, pH 8.0; gradual smooth boundary.

BC—12.5 to 32.5 inches (32 to 83 centimeters); yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; 7 percent clay; weak fine subangular blocky structure; soft, friable, nonsticky and slightly plastic; common very fine, common fine, and common medium roots throughout; common fine irregular pores; noneffervescent; slightly alkaline, pH 7.8; gradual wavy boundary.

C1—32.5 to 59.5 inches (83 to 151 centimeters); reddish yellow (5YR 7/6) fine sandy loam, reddish yellow (5YR 7/6) moist; 5 percent clay; single grain; loose, nonsticky and nonplastic; common very fine roots throughout; common fine irregular pores; 3 percent gravel; noneffervescent; slightly alkaline, pH 7.6; gradual wavy boundary.

C2—59.5 to 68 inches (151 to 173 centimeters); reddish yellow (5YR 7/6) loamy fine sand, reddish yellow (5YR 7/6) moist; 4 percent clay; single grain; loose, nonsticky and nonplastic; common very fine roots throughout; common fine irregular pores; 12 percent gravel; noneffervescent; slightly alkaline, pH 7.6.

Range in Characteristics

Clay content in the particle-size control section: Average of less than 18 percent

Note: This soil has discontinous sand lenses, primarily from Navajo Sandstone and Wingate Sandstone sources, that vary in size, extent, and prominence

Ap horizon:

Hue—7.5YR or 5YR
Value—4 or 5 dry; 3 or 4 moist
Chroma—3 or 4, dry or moist
Texture—loam, fine sandy loam, or sandy clay loam
Clay content—18 to 25 percent
Calcium carbonate equivalent—0 to 10 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 10 percent gravel
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

Bw or BC horizon:

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

Clay content—12 to 22 percent
Calcium carbonate equivalent—0 to 3 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 15 percent gravel and channers
Reaction—neutral to moderately alkaline (pH 6.6 to 8.4)

C horizons:
Value—5 to 7 dry; 4 to 7 moist
Chroma—4 or 6, dry or moist
Texture—loamy fine sand or fine sandy loam
Clay content—4 to 12 percent
Calcium carbonate equivalent—0 to 4 percent
Electrical conductivity—0 to 2 mmhos/cm
Rock fragments—0 to 35 percent gravel and cobbles
Reaction—neutral or slightly alkaline (pH 6.6 to 7.8)

107—Ustic Torriorthents-Rock outcrop-Badland complex, 4 to 54 percent slopes, extremely bouldery

Map Unit Setting

General setting: Sites adjacent to Glen Canyon National Recreation Area and escarpments of Circle Cliffs and associated structural benches
Major land resource area: 35—Colorado Plateau
Elevation: 4,090 to 7,150 feet (1,247 to 2,180 meters)
Mean annual precipitation: 10 to 14 inches (250 to 350 millimeters)
Mean annual air temperature: 52 to 55 degrees F (11.0 to 13.0 degrees C)
Mean annual soil temperature: 54 to 57 degrees F (12.1 to 14.1 degrees C)
Frost-free period: 135 to 165 days

Map Unit Composition

Note: This map unit is assigned an extremely bouldery phase because 10 to 20 percent of the soil surface is covered by stones and boulders.

Ustic Torriorthents and similar soils: 45 percent
Rock outcrop: 30 percent
Badland: 25 percent

Description of the Ustic Torriorthents

Note: This component is correlated at the subgroup level because the clay content in the particle-size control section ranges from 10 to 25 percent and the rock fragment content ranges from 15 to 55 percent. The variability of both of these characteristics exceeds family class limits.

Taxonomic classification: Ustic Torriorthents
Landform: Talus slopes, side slopes, and structural benches
Geology: Chinle Formation (Trassic) and colluvial deposits (Quaternary)
Parent material: Colluvium and/or slope alluvium derived from sandstone and shale
Slope: 4 to 54 percent, north aspect
Depth to restrictive feature(s): Lithic bedrock at a depth of 20 to 40 inches
Drainage class: Somewhat excessively drained
Slowest permeability: 2.0 to 6.0 in/hr (moderately rapid)
Available water capacity (total inches): About 1.4 (very low)
Shrink-swell potential: About 1.5 LEP (low)
Flooding hazard: None

Ponding hazard: None
Depth to seasonal water table (minimum): More than 60 inches
Runoff class: High
Hydrologic group: B
Calcium carbonate content (maximum): About 5 percent
Salinity maximum: About 2 mmhos/cm (nonsaline)
Sodium adsorption ratio (maximum): About 1 SAR (slightly sodic)
Ecological site name: Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)
Ecological site number: R035XY263UT
Present vegetation (in most areas): Utah juniper, pinyon, broom snakeweed, Ephedra cutleri, and Indian ricegrass
Land capability classification (nonirrigated areas): 6c
Ground cover (percent):

Plant canopy	5
Litter (<5 mm)	12
Rock fragments	71
Bare soil	12
Cyanobacteria crust	0
Lichen crust	0
Moss crust	0
Salt crust	0
Gypsum crust	0

Typical Profile

Geographic Coordinate System (Universal Transverse Mercator): 578164 meters E., 4220290 meters N., zone 12

A—0 to 1 inch (0 to 3 centimeters); reddish brown (2.5YR 5/4) cobbly sandy loam, reddish brown (2.5YR 4/4) moist; 14 percent clay; weak thin platy structure; loose, slightly sticky and nonplastic; many fine roots throughout; common fine dendritic tubular pores; 10 percent gravel and 10 percent cobbles; strongly effervescent, by HCl, 1 normal; slightly alkaline, pH 7.6; clear smooth boundary.

C1—1 to 8 inches (3 to 20 centimeters); reddish brown (2.5YR 5/4) cobbly sandy loam, reddish brown (2.5YR 4/3) moist; 12 percent clay; massive; slightly hard, very friable, nonsticky and nonplastic; many fine and common medium roots throughout; many fine dendritic tubular pores; 10 percent gravel, 10 percent cobbles, and 5 percent stones; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; clear smooth boundary.

C2—8 to 23 inches (20 to 58 centimeters); reddish brown (2.5YR 5/4) very stony sandy loam, reddish brown (2.5YR 4/4) moist; 16 percent clay; massive; moderately hard, friable, slightly sticky and slightly plastic; many fine and many medium roots throughout; many fine dendritic tubular pores; 10 percent gravel, 10 percent cobbles, and 30 percent stones; strongly effervescent, by HCl, 1 normal; moderately alkaline, pH 8.0; abrupt wavy boundary.

R—23 to 33 inches (58 to 84 centimeters); indurated, unweathered, unfractured sandstone.

Range in Characteristics

Reaction: pH 7.4 to 8.4 (slightly alkaline or moderately alkaline)

A horizon:
Hue—2.5YR, 5YR, or 7.5YR
Value—4 or 5 dry; 3 to 5 moist
Chroma—3 to 6, dry or moist

C horizons:

Hue—2.5YR, 5YR, or 7.5YR
Value—4 to 6 dry; 3 to 5 moist
Chroma—3 to 6, dry or moist
Texture—sandy clay loam or sandy loam
Clay content—10 to 25 percent
Rock fragments—15 to 55 percent

Description of the Rock Outcrop

This component consists of sandstone bedrock that is typically exposed on ledges and cliff faces (Wingate Sandstone). It also includes areas where the depth to bedrock is less than 4 inches (10 centimeters).

Description of the Badland

This component consists of moderately steep to very steep barren land that is dissected by many intermittent drainage channels. These areas are cut into soft material of the Chinle Formation. Badland also includes areas where the depth to soft bedrock is less than 4 inches (10 centimeters).

108—Water

Map Unit Setting

Major land resource area: 35—Colorado Plateau

Map Unit Composition

Water: 100 percent

Description

This map unit consists of perennial streams and man-made impoundments that typically contain at least some water throughout the year.