United States
Department of
Agriculture

Soil
Conservation
Service

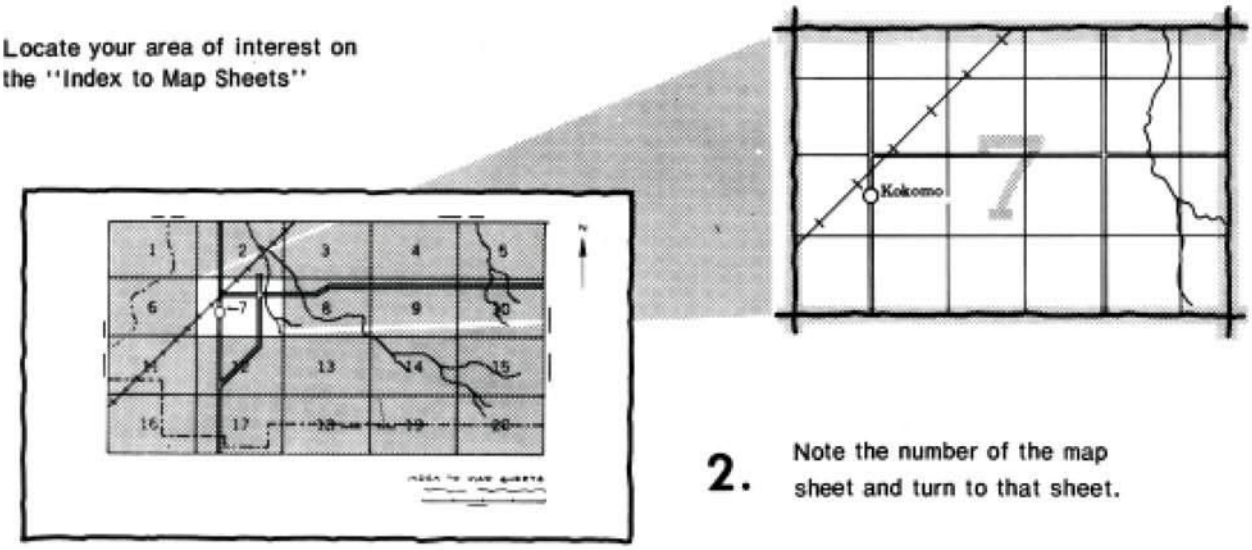
In Cooperation with
United States Department
of Agriculture,
Forest Service, and
New Mexico Agricultural
Experiment Station

Soil Survey of Grant County New Mexico

Central and Southern Parts

HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"



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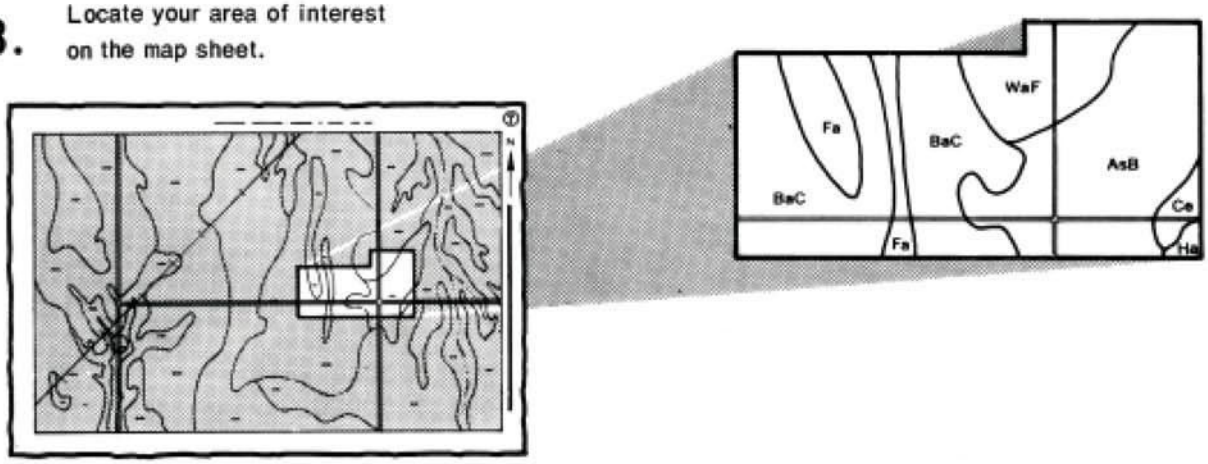

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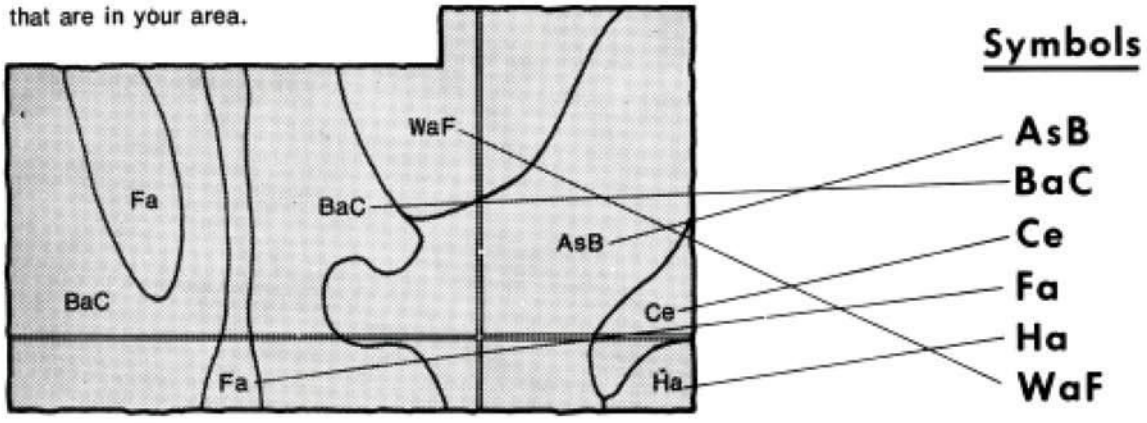
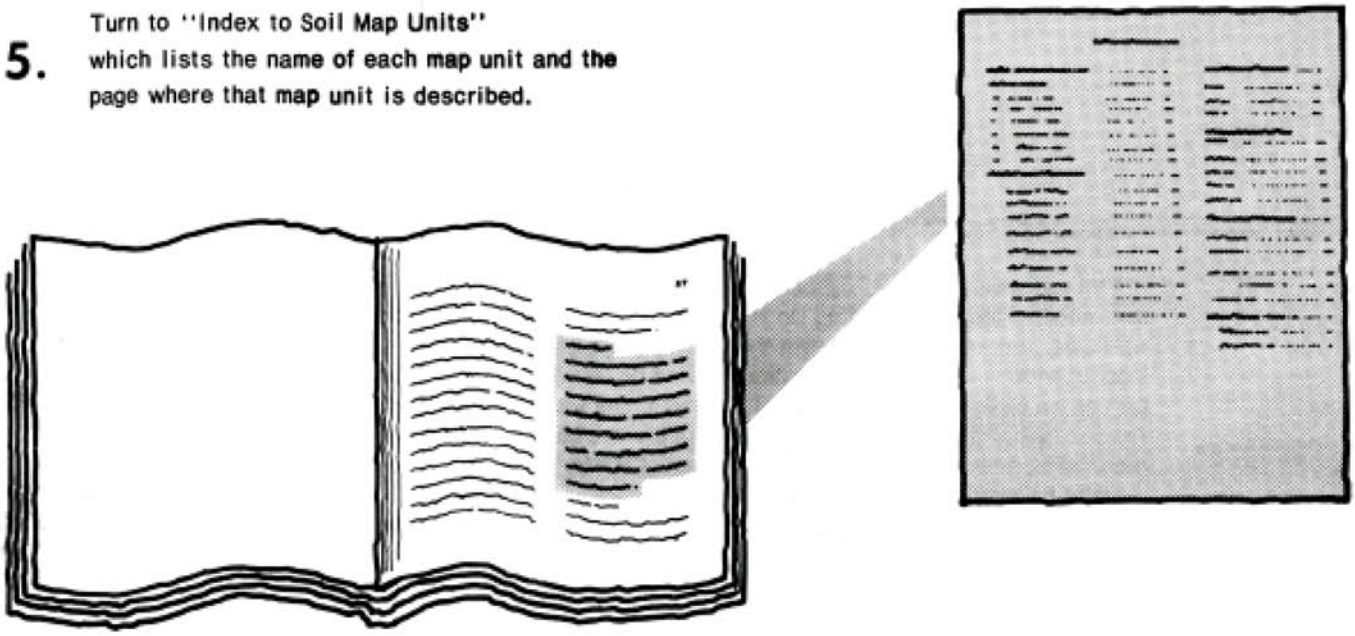
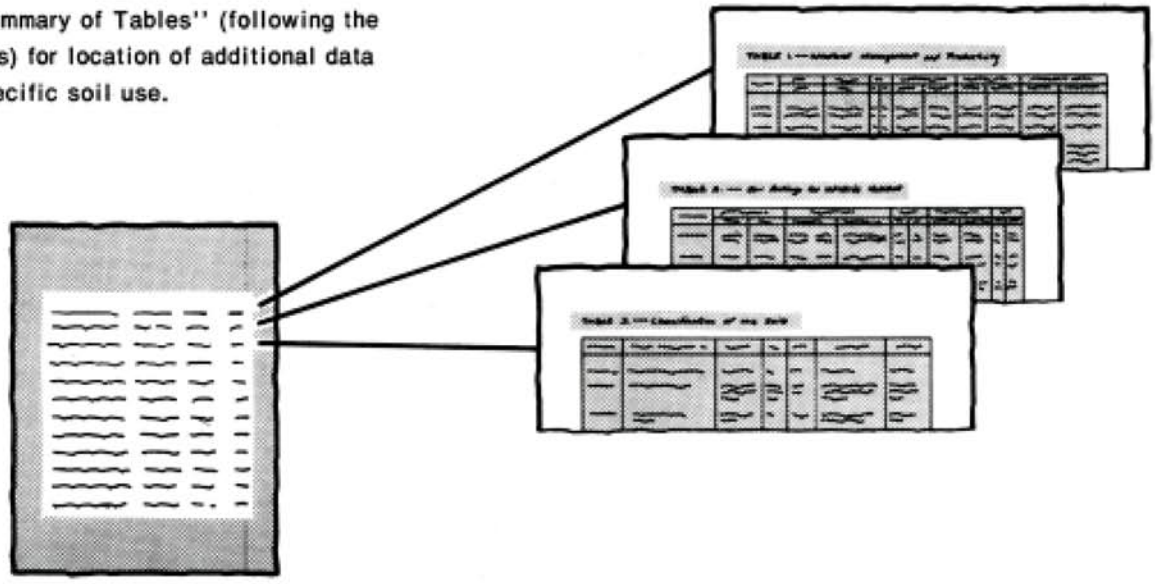


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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 Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This publication is designed to meet the needs of private landowners as well as those of the Forest Service. It is divided into three parts. Part I gives information that is applicable both to privately owned land and to land administered by the Forest Service; Part II describes the privately owned land; and Part III describes the land administered by the Forest Service.

Major fieldwork for this soil survey was performed in the period 1973-78. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service and Forest Service and the New Mexico Agricultural Experiment Station. It is part of the technical assistance furnished to the Grant and Hidalgo Soil and Water Conservation Districts.

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

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Foreword

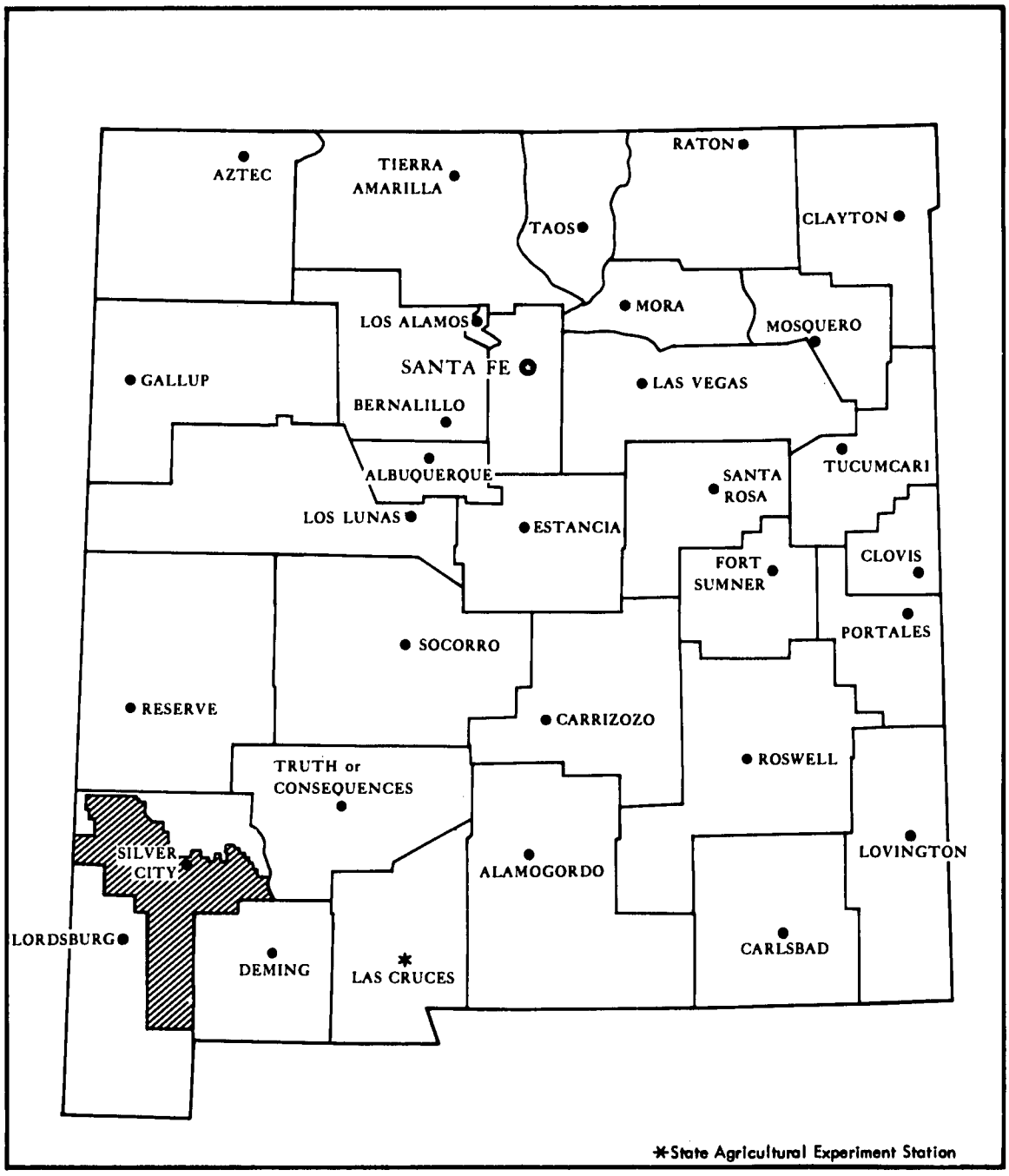
This soil survey contains information that can be used in land-planning programs in Grant County, New Mexico, Central and Southern parts. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

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

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

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

Albert W. Hamelstrom
State Conservationist
Soil Conservation Service



Location of Grant County, New Mexico, Central and Southern Parts.

soil survey of
Grant County, New Mexico
Central and Southern Parts

By Tommie Lee Parham, Soil Conservation Service,
and Ronald Paetzold and Charles E. Souders, Forest Service

Fieldwork by Tommie Lee Parham, Thomas E. Calhoun, Harold B. Maxwell,
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Soil Conservation Service,
and Raymond L. Kingston, Charles E. Souders, and Ronald W. Stein,
Forest Service

United States Department of Agriculture,
Soil Conservation Service and Forest Service,
in cooperation with New Mexico Agricultural Experiment Station

This publication is designed to meet the needs of private landowners as well as those of the Forest Service. It is divided into three parts. Part I gives information that is applicable both to privately owned land and to land administered by the Forest Service; Part II describes the privately owned land; and Part III describes the land administered by the Forest Service.

Part I. Information applicable to privately owned and Forest Service land

This part discusses the climate in the survey area, describes how the survey was made, discusses factors of soil formation, and describes the general soil map units in the survey area.

Grant County, Central and Southern Parts, consists mainly of the area of Grant County that lies south of the Gila National Forest. It also includes the Big Burro Mountains area of the Gila National Forest and an area of the Gila National Forest adjacent to Fort Bayard. The survey area is in the Southern Rocky Mountains physiographic province. It has a total area of approximately 1,854,367 acres, or 2,897 square miles. Silver City is the county seat of Grant County. In 1974 the estimated population of the survey area was 23,400. In 1973 the estimated population of Silver City was 9,000.

Elevation of the survey area ranges from 4,000 feet along the Gila River at Redrock to 8,000 feet near Pinos Altos and Jack's Peak. Generally, elevation in the northern part of the survey area is more than 5,000 feet, and in the southern part it ranges from 4,000 to 5,000 feet.

The southern part of the survey area is characterized by valley fill sediment that forms broad upland plains between mountain ridges. This part includes the area extending from the southern end of the county north to the area between Bayard and the Big Burro Mountains and the area around Redrock. The rest of the survey area is characterized by mountains and hills capped with igneous rock, deep canyons, and entrenched streams. Two major streams flow through the survey area—the Gila River in the northwestern part and the Mimbres River along the eastern edge.

The climate and precipitation in the survey area vary with elevation. In the southern part of the area, the average annual temperature is about 60 degrees F and the average annual precipitation is about 10 inches. In the northern part of the area, the average annual temperature is about 51 degrees and the average annual precipitation is about 14 inches.

Copper mining and ranching are the most important industries in the survey area. Gold, silver, lead, zinc, lime, manganiferous ore, and molybdenum are also mined. The ranching industry maintains about 35,000 brood cows on 1,250,000 acres of rangeland. Some farming is conducted in the Gila River and Mimbres River valleys and at the southern end of the county. There are about 7,200 acres of irrigated cropland and 800 acres of dryfarmed cropland in the survey area. The main crops are alfalfa hay, improved grasses for pasture, and small grain. Other crops include vegetables, orchard crops, and grain sorghum.

Descriptions, names, and delineations of the soils in this soil survey do not fully agree with soil maps in adjacent surveys published at a different date. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, and the extent of the soils within the survey area. In some places it is more feasible to combine small acreages of similar soils that respond to use and management in much the same way than it is to separate these soils and give them names.

Climate

By Frank E. Houghton, climatologist for New Mexico, National Weather Service, U.S. Department of Commerce.

The climate of this survey area is semiarid and exhibits a wide range in daily and annual temperatures (*3*). Sunshine in the area is plentiful, and the relative humidity is low. The climate is highly variable because of the wide range in the elevation of the area and the uneven topography. Table 1 in Part II of this survey gives data on temperature and precipitation for the survey area as recorded at Fort Bayard, New Mexico, in the period 1931-60.

This survey area is in two major climatic zones. The southern part of the area is in the first climatic zone. The average annual precipitation in this zone is 8 to 12 inches, and more than half of the precipitation falls from July through September. The highest annual precipitation, 18.02 inches, was recorded in Hachita in 1931. The lowest annual precipitation, recorded in 1910, is 4.38 inches. Some of the precipitation falls as snow in December through February. The snow usually melts fairly rapidly.

The elevation in this climatic zone ranges from 4,000 to 5,500 feet. As the elevation increases, the precipitation increases and the temperature decreases. The average annual temperature is 58 to 62 degrees F. The highest temperature ever recorded at Hachita was 108 degrees.

The growing season extends from April through October and ranges from 180 to 220 days.

The northern and central parts of the survey area are in the second major climatic zone. The average annual precipitation in this zone is 12 to 19 inches, and almost 50 percent of the precipitation falls from July through September. The source of this precipitation is mainly moist air from over the Gulf of Mexico. The precipitation occurs mostly as brief but occasionally heavy thunderstorms. Spring and fall are relatively dry. A small increase in precipitation occurs in winter. Its source is moist air from over the Pacific Ocean. On an average of 20 to 30 days a year, as much as 0.10 inch of precipitation falls. Occasionally, heavy rainfall from tropical Pacific storms over the Gulf of California reach southwestern New Mexico and cause some local flooding.

The highest annual precipitation, recorded in 1958 at Silver City, is 26.19 inches. The lowest annual precipitation, recorded in 1947, is 6.77 inches. Some of the precipitation in November through March falls as snow.

The elevation in this climatic zone ranges from 5,000 to 8,000 feet. As the elevation increases, the precipitation increases and the temperature decreases. The average annual temperature is 47 to 57 degrees F. The lowest temperature on record, which occurred in January 1913 at Silver City, is -12 degrees. The highest recorded temperature is 103 degrees, which occurred in July 1958.

The maximum temperatures in midsummer generally are in the eighties. On an average of only 27 days each year, the high temperature reaches or exceeds 90 degrees F. Temperatures of 100 degrees or more are very rare. Because of rapid cooling after sundown, which is typical of higher mountain valleys, Silver City has cool, pleasant summer nights. Winters are characterized by moderately warm days, and the temperature in the shade during the warmest part of the day is near 50 degrees. On the average, only 2 days in winter do not have temperatures above freezing. Winter nights generally are cool, and freezing temperatures occur much of the time from early in November through March. Temperatures below zero, however, have been recorded on only 18 days in the 28 years of record.

The growing season extends from mid-April through mid-October and ranges from 150 to 180 days.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots (*6*).

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

This survey was mapped at two levels of intensity, or detail. The more detailed part is identified by narrowly defined units, and the less detailed part is identified by broadly defined units. In the narrowly defined units the soil delineation boundaries were plotted and verified at closely spaced intervals. In the broadly defined units the soil delineation boundaries were plotted and verified by some observations. The intensity of mapping was based on the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use. On the soil map legend at the back of this survey, the broadly defined units are identified by an asterisk following the map unit name.

Factors of soil formation

Soil is unconsolidated mineral material on the earth's surface that supports plant growth (*7*). An individual soil is a three-dimensional body that occupies space. The shape of an individual soil body also varies and may or may not be predictable. The size and shape of individual

soil bodies are often related to the shape and nature of landforms.

Soil is a naturally occurring body. It is the result of the interaction of five soil-forming factors: (1) plants and animals, (2) climate, (3) the parent material, (4) relief, and (5) time. The effect of any one factor may be altered by the other four.

The interaction of all the soil-forming factors determines the characteristics of the soil pedon. The interaction of the factors is very complex, and it is difficult to isolate the effects of any one factor. Some soils, however, have been more strongly influenced by one or more of the factors than by the others. Montmorillonitic parent material, for example, has been a dominant influence on the Lehmans and Verhalen soils. Climate and relief have been dominant influences on the Santana and Santa Fe soils. Plant life greatly influenced the formation of the Manzano, Paymaster, Sampson, and Ruidoso soils.

The five major factors of soil formation are discussed separately in the following pages.

Parent material

The soils in the survey area formed in a variety of parent materials that range in age from Precambrian to Holocene. The material includes intrusive and volcanic igneous rock, marine sediment, and continental deposits (*5*). The numerous kinds of rock and their varying ages have resulted in many different kinds of soil in the area.

Rock of Quaternary age, the most recent, is parent material of soils such as those in the Manzano, Paymaster, and Ellicott series that are on flood plains and in valleys; those in the Mohave, Stellar, Verhalen, and Mimbres series that are on plains and fans and in bolsons; and Lithic Haplargids on hills.

Rock of Tertiary age is the parent material of nearly 40 percent of the soils in the survey area, including soils such as those in the Lonti, Luzena, Judd, Jonale, and Guy series. These soils are well dispersed throughout the area. This parent material is variable. It includes Gila conglomerate, rhyolite, andesite, and tuff.

Rock of Cretaceous age is the parent material of soils such as those in the Graham, Lehmans, and Carnero series. This rock includes Colorado Shale, Beartooth Quartzite, and Sarten Sandstone in the central part of the survey area, and Laramide Volcanic Rock and the Late Cretaceous Virden Formation in the western part of the survey area (*2*).

Rock on the steep mountainsides in the north-central part of the survey area is of Pennsylvanian age. This rock includes limestone, shale, and sandstone. Soils of the Oro Grande and Encierro series are representative of those that weathered from this rock.

The Precambrian rock in the mountainous areas in the north-central and west-central parts of the survey area is the oldest geological material in the area. Soils of the Santana series are examples of those that formed in this material.

Plants and animals

Plant and animal life both on and in the soil have an effect on soil formation. Organic material such as decaying roots, stems, leaves, and branches is added to the soil. A multitude of micro-organisms in the soil work on plant and animal remains. Insects and burrowing animals mix the soil. Larger animals trample the soil, which breaks up the surface crust and allows more moisture to enter. Animals also add organic matter and other nutrients. Man applies fertilizers, soil amendments, and other material to the soil and extracts products from it, which also change the nature of the soil.

The influence of man on soil formation in the survey area has been minimal, except in irrigated areas and in areas that have been urbanized. Man has depleted some nutrients and added others by incorporating waste products from livestock operations, green manure crops, commercial fertilizers, and garbage. Erosion in some places has occurred as a result of a loss of the protective plant cover because of overgrazing; however, the soils can be protected from erosion by leaving mulch and stubble on the surface and by using windbreaks.

Soils in the survey area have formed under several general types of vegetation. Each type has a specific influence on soil formation. In the southern part of the survey area, the vegetation is mainly desert shrubs and warm-season grasses. Precipitation is low in this area, and plant growth is not so vigorous as it is in the cooler, northern part. Soils of the Tres Hermanos, Mohave, and Bucklebar series are examples of soils that formed under these conditions. These soils have low organic matter content.

In the northern part of the survey area, the vegetation is mainly cool-season grasses, shrubs, juniper, pinyon, ponderosa pine, and a few warm-season grasses. Precipitation is higher in this area, and evaporation is lower. The plants grow more vigorously and produce more litter. Soils of the Manzano, Ruidoso, Sanloren, and Muzzler series are examples of soils that formed under these conditions. These soils have high organic matter content.

Relief

Relief affects soil formation by its influence on drainage, erosion, plant cover, and soil temperature. The relief of the survey area is varied.

Generally, the deeper soils that have distinct horizons are gently sloping. Runoff is slow on these soils, and the loss of soil material by water erosion is slight. The shallower soils that have less distinct horizons are steep and are on ridges. Runoff is rapid on these soils. They have formed very slowly because they erode faster than

they form distinct horizons. The amount of moisture that enters the soils decreases with slope.

Relief and surface drainage are closely related. The main drainageways in the survey area are the Gila River, the Mimbres River, the San Francisco River, and numerous washes and arroyos. The Gila River drains most of the northern highlands and areas west of the Continental Divide. The Mimbres River drains the area east of the Continental Divide. This river, however, is dry in the area south of San Lorenzo during the irrigation season.

Although the San Francisco River does not flow through the survey area, it drains the northwest corner of the area, near Mule Creek. The southern part of the area, near Hachita, is drained by numerous washes and arroyos that originate in various hills and mountains in surrounding areas.

In this survey area there are two areas where the soils do not reflect the effect that relief generally has on soil formation. The nearly level soils on flood plains formed in recently deposited alluvial sediment and have not had time to form distinct horizons, and the steep soils on hills and mountains have distinct horizons because of increased rainfall at higher elevations.

Climate

Climate is the major soil-forming factor that most influences formation of soils in this survey area. It affects the vegetation, parent material, drainage, and topography of the area. The major elements of climate are temperature, precipitation, humidity, and wind. Generally, as elevation increases, precipitation increases, temperature decreases, and humidity increases.

The climate of this survey area is highly varied because of the wide range in elevation and the uneven topography. Elevation ranges from 4,000 feet near Hachita and Redrock to 8,000 feet near Jack's Peak. The average annual temperature ranges from about 44 to 62 degrees F, and the average annual precipitation ranges from 8 to 20 inches. Fifty percent of the precipitation falls during thunderstorms in July and September. These are usually high intensity storms and, consequently, much of the moisture runs off.

When rains are gentle, some of the nearly level soils absorb most of the water, which results in deeper leaching of soluble salts, greater movement of clay, and more lush plant growth. As a result more soil material and distinct horizons are formed.

Time

Soils form over a long period of time. The length of time that soil-forming factors have been acting on parent material is reflected in the soil profile. As the length of time increases, development of the profile becomes more apparent. Organic matter content from plants and animals is higher in the surface layer, and lime and very fine clay are leached downward and built up in the underlying layers. If the soil-forming factors remain unchanged, changes in the soil horizons are very slow once the soil nears equilibrium with its environment.

In this survey area most of the irrigated soils are on recently deposited flood plains and fans. These soils generally are deep, are moderately permeable, and are rich in most mineral plant nutrients. They have no apparent horizons other than those containing organic matter.

The Haverson, Stirk Variant, Ellicott, and Gila Variant soils are examples of soils that have little or no profile development. The parent material has undergone very little change. The Manzano, Mimbres, and Guy soils show evidence of some profile development. Soluble salts have been leached downward, and the soil horizons are recognizable. The Lonti, Mohave, Stellar, and Ruidoso soils are highly developed. Soluble salts have been leached downward, and clay has moved into the lower horizons.

General soil map units

The general soil map at the back of 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, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units 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.

The 13 general map units in this survey have been grouped into 2 general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

Soils dominantly on alluvial flats, alluvial fans, hills, terraces, and ridges and in drainageways

This group consists of four map units. It makes up about 34 percent of the survey area. The soils in this group are nearly level to very steep. Elevation is 4,000 to 5,500 feet. The average annual precipitation is about 8 to 12 inches, and the average annual air temperature is about 58 to 63 degrees F.

The soils in this group are shallow to deep and are moderately well drained and well drained.

This group is used mainly for livestock grazing, wildlife habitat, and recreation.

1. Tres Hermanos-Upton-Nickel

Nearly level to moderately sloping, well drained, deep and shallow soils; on alluvial fans, terraces, and foot slopes

This map unit is on foot slopes that generally are elongated, on terraces that are long and narrow, and on fans that commonly are broad and rounded. Slope is 0 to 15 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, and the average annual air temperature is 58 to 62 degrees F.

This unit makes up about 9 percent of the survey area. It is about 32 percent Tres Hermanos soils, 28 percent Upton soils, and 19 percent Nickel soils. The remaining 21 percent is soils of minor extent.

Tres Hermanos soils are on alluvial fans, terraces, and foot slopes. They are deep and are nearly level to gently sloping. The surface layer is reddish brown gravelly sandy clay loam, the subsoil is reddish brown clay loam and gravelly clay loam, and the substratum is pink gravelly sandy loam and is more than 15 percent calcium carbonate.

Upton soils are on alluvial fans, terraces, and foot slopes. They are shallow and are nearly level to gently sloping. The surface layer is pale brown gravelly loam, the subsoil is brown gravelly clay loam, and the substratum is white indurated caliche.

Nickel soils are on alluvial fans. They are deep and are gently sloping to moderately sloping. The surface layer is brown gravelly sandy loam, the subsoil is brown gravelly sandy clay loam and very gravelly sandy clay loam, and the substratum is light brown very gravelly silt loam and very gravelly loamy sand.

Of minor extent in this unit are deep Stellar, Continental, and Mohave soils on alluvial fans and along drainageways and shallow Lehmans soils on hills. All of these soils are well drained.

This unit is used mainly for livestock grazing, wildlife habitat, and recreation. Low precipitation, the content of coarse fragments, and the high content of calcium carbonate are the major limitations. Overgrazing is a major management concern because it leaves the soils in this unit subject to soil blowing and gullying and results in an increase in the number of undesirable plants. Proper compaction of the soils generally is required if ponds are constructed.

This unit supports Chihuahuan Desert shrub vegetation. It provides habitat for wildlife such as javelina, desert mule deer, desert cottontail, white-throated wood rat, scaled quail, black-throated sparrow, loggerhead shrike, and round-tailed horned lizard. Populations of wildlife generally are low because the plant community has deteriorated in most places.

2. Lithic Haplargids-Rock outcrop-Orthents

Moderately sloping to very steep, well drained, shallow to deep soils, and Rock outcrop; on hills, ridges, and breaks

This map unit is on hills, ridges, and breaks. The hills are large and irregularly shaped. They have high relief and are dissected by narrow drainageways. The ridges are elongated. Slope is 5 to 75 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, and the average annual air temperature is 58 to 62 degrees F.

This unit makes up about 6 percent of the survey area. It is about 42 percent Lithic Haplargids and similar soils, 17 percent Rock outcrop, and 12 percent Orthents. The remaining 29 percent is soils of minor extent.

Lithic Haplargids are throughout the unit. No single profile is typical of these soils. Texture varies greatly, and the content of gravel ranges from 0 to 50 percent or more. These soils are shallow, and they have an accumulation of clay.

Rock outcrop consists of exposures of rock.

Orthents are on eroded ridges and breaks. No single profile is typical of these soils. Texture varies greatly, and the content of gravel ranges from 0 to 50 percent or more. These soils are shallow to deep, and they exhibit little horizon development.

Of minor extent in this unit are Nickel, Upton, Graham, and Tres Hermanos soils on hillsides and alluvial fans, Stellar and Mohave soils in depressional areas, and Mimbres soils in drainageways. All of these soils are well drained.

This unit is used mainly for livestock grazing, wildlife habitat, and recreation. Steepness of slope, shallow depth of the soils, low precipitation, and areas of Rock outcrop are the main limitations. Overgrazing leaves the soils subject to soil blowing and gullying and results in an increase in the number of undesirable plants.

The soils in this unit on hills support bighorn sheep, ringtail, rock rattlesnake, and canyon tree frogs in addition to the wildlife species found on adjacent general soil map units. The high cliffs and steep ledges provide perching and nesting sites for birds of prey.

3. Stellar-Mimbres-Hondale

Nearly level, well drained and moderately well drained, deep soils; on flood plains and in bolsons, playas, and drainageways

This map unit is on flood plains, in bolsons, in playas that are broad and round, and in drainageways that are narrow and elongated (fig. 1). Slope is 0 to 3 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, and the average annual air temperature is 58 to 63 degrees F.

Figure 1.—Typical area of general map unit 3, near Hachita. The vegetation is mainly soaptree yucca and tobosa.

This unit makes up about 4 percent of the survey area. It is about 21 percent Stellar soils, 16 percent Mimbres and similar soils, 15 percent Hondale and similar soils, and 15 percent Verhalen soils. The remaining 33 percent is soils of minor extent.

Stellar soils are well drained. They are in drainageways. The surface layer is brown sandy clay loam, the subsoil is reddish brown clay and clay loam, and the substratum is pink gravelly clay loam.

Mimbres soils are well drained. They are in playas and on flood plains. The surface layer is brown silty clay loam, the subsoil is reddish brown silty clay loam, and the substratum is reddish brown silty clay loam.

Hondale soils are well drained. They are in bolsons. The surface layer is light brown sandy loam, the subsoil is brown clay and light brown clay loam, and the substratum is light brown and pinkish white clay loam, sandy clay, and sandy clay loam. The content of sodium in these soils is more than 15 percent.

Verhalen soils are moderately well drained. They are in bolsons. The surface layer is pinkish gray silty clay, and the underlying material is brown clay.

Of minor extent in this unit are Stellar and Mohave soils on alluvial fans and along drainageways, Tres Hermanos and Nickel soils on alluvial fans, Anthony and Gila Variant soils on flood plains, and Riverwash in drainage channels. The Anthony and Gila Variant soils are dominant in the Redrock area. All of these soils are deep and well drained.

This unit is used mainly for livestock grazing, wildlife habitat, and recreation. Some areas near Redrock that are irrigated are used for cultivated crops. The high content of clay, low precipitation, and the high content of sodium are the main limitations. Overgrazing is a major management concern because it leaves the soils subject to soil blowing and gullying and results in an increase in the number of undesirable plants.

Because the wildlife habitat on the part of this unit in

playas and valleys is constantly changing, it is used only seasonally and sporadically by wildlife. The part of the unit near Redrock includes areas of irrigated cropland and areas of tall, deciduous trees and riparian vegetation on flood plains. The areas of cropland provide food for large numbers of birds, and the areas of trees and riparian vegetation provide some of the most valuable wildlife habitat in the survey area.

About 100 species of birds breed on this unit, including 7 endangered and 42 restricted species. There are at least 75 species of mammals, of which 1 is endangered and 9 are restricted in range. There are 70 species of herpetiles, of which 6 are endangered and 21 are restricted in range.

4. Stellar-Mohave-Bucklebar

Nearly level to gently sloping, well drained, deep soils; on alluvial fans and plains

This map unit is on alluvial fans and plains that are elongated. Slope is 0 to 5 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, and the average annual air temperature is 58 to 62 degrees F.

This unit makes up about 15 percent of the survey area. It is about 28 percent Stellar and similar soils, 19 percent Mohave and similar soils, 12 percent Bucklebar soils, and 9 percent Sonoita soils. The remaining 32 percent is soils of minor extent.

Stellar soils have a surface layer of brown sandy clay loam, a subsoil of reddish brown clay and clay loam, and a substratum of pink gravelly clay loam.

Mohave soils have a surface layer of pale brown sandy clay loam, a subsoil of brown clay loam and sandy clay loam, and a substratum of light brown sandy loam.

Bucklebar soils have a surface layer of brown sandy loam, a subsoil of reddish brown and strong brown sandy clay loam and clay loam, and a substratum of reddish brown sandy clay loam.

Sonoita soils have a surface layer of brown loamy sand, a subsoil of brown sandy loam, and a substratum of light brown gravelly loamy sand.

Of minor extent in this unit are the Continental, Whitehouse, Ruidoso, Tres Hermanos, Mimbres, and Nickel soils that are deep and are on flats, plains, and fans and the Conger and Upton soils that are shallow to caliche and are on upland ridges and fans.

This unit is used mainly for livestock grazing and wildlife habitat. It can be used for cultivated crops and specialty crops if irrigation water is available. Overgrazing is a major management concern because it leaves the soils subject to soil blowing and gullying and results in an increase in the number of undesirable plants.

This unit supports Chihuahuan Desert grassland vegetation that provides habitat for diverse wildlife species including many resident and migrant birds. Among the other species are pronghorn antelope, coyote, black-tailed jackrabbit, many burrowing rodents, and the spadefoot toad. Birds use the tall woody vegetation on this unit for nesting, particularly in winter.

Soils dominantly on hills, mountains, and flood plains

This group consists of nine map units. It makes up about 66 percent of the survey area. The soils in this group are nearly level to extremely steep. Elevation is 5,000 to 8,000 feet. The average annual precipitation is about 12 to 19 inches, and the average annual air temperature is about 47 to 57 degrees F.

The soils in this group are shallow to deep and are well drained and somewhat excessively drained.

This group is used for livestock grazing, wildlife habitat, irrigated crops, recreation, woodland, and urban development.

5. Manzano-Paymaster-Ellicott

Nearly level to moderately sloping, well drained and somewhat excessively drained, deep soils; mainly on flood plains and alluvial fans

This map unit is mainly on elongated flood plains and alluvial fans along the Mimbres and Gila Rivers. Slope is 0 to 15 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 48 to 55 degrees F.

This unit makes up about 3 percent of the survey area. It is about 27 percent Manzano soils, 22 percent Paymaster and similar soils, 12 percent Ellicott and similar soils, and 7 percent Ruidoso and similar soils. The remaining 32 percent is soils of minor extent.

Manzano soils are well drained and are on flood plains and along drainageways. The surface layer is brown loam, the subsoil is brown clay loam, and the substratum is brown clay loam.

Paymaster soils are well drained and are on flood plains. The surface layer is grayish brown fine sandy loam, and the underlying material is dark grayish brown very fine sandy loam and fine sandy loam.

Ellicott soils are somewhat excessively drained and are on flood plains. The surface layer is dark yellowish brown gravelly sand, and the underlying material is dark yellowish brown gravelly sand.

Ruidoso soils are well drained and are on alluvial fans.

The surface layer is dark grayish brown clay loam, the subsoil is dark grayish brown and brown clay, and the substratum is brown sandy clay loam.

Of minor extent in this unit are Sanloren and Majada Variant soils on old river terraces; Tesajo, Lonti, and Guy soils on foot slopes and terraces adjacent to river valleys; Haverson and similar soils on flood plains and alluvial fans; and Stirk Variant and similar soils on flood plains. All of these soils are deep and well drained.

This unit is used mainly for irrigated crops, livestock grazing, wildlife habitat, and urban development (fig. 2). The hazards of flooding and soil blowing are the major limitations. Overgrazing leaves the soils subject to soil blowing and gullying and results in an increase in the number of undesirable plants.

The areas of cropland on this unit provide food for birds, and the areas of deciduous trees and riparian vegetation provide some of the most important wildlife habitat in the survey area. About 100 species of birds breed on this unit, including 7 that are endangered and 42 that are restricted in range. There are at least 75 species of mammals, of which 1 is endangered and 9 are restricted in range. There are 70 species of herpetiles, of which 6 are endangered and 21 are restricted in range.

6. Luzena-Rock outcrop-Muzzler

Moderately sloping to extremely steep, well drained, shallow soils, and Rock outcrop; on mountains and hills

This map unit is on mountains and hills that generally are broad and are characterized by ledges and ridges that are elongated. Slope is 5 to 100 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 48 to 55 degrees F.

This unit makes up about 22 percent of the survey area. It is about 31 percent Luzena soils, 29 percent Rock outcrop, and 21 percent Muzzler soils. The remaining 19 percent is soils of minor extent.

Luzena soils are on hills. The surface layer is brown gravelly clay loam, and the subsoil is brown gravelly clay loam and clay.

Rock outcrop consists of exposures of bedrock on hills.

Figure 2.—Irrigated alfalfa on general map unit 5, near Gila.

Muzzler soils are on hills and mountains. The surface layer is dark grayish brown cobbly sandy loam, and the subsoil is very dark grayish brown and dark brown very cobbly clay.

Of minor extent in this unit are deep Manzano, Ruidoso, and similar soils in drainage valleys and on alluvial fans, deep Lonti and Guy soils on old piedmont slopes, and moderately deep Abrazo soils on hills and mountains.

This unit is used mainly for livestock grazing, wildlife habitat, and recreation. Steepness of slope, depth to bedrock, areas of Rock outcrop, and small stones are the major limitations. Overgrazing leaves the soils in this unit subject to soil blowing and gullying and results in an increase in the number of undesirable plants. Livestock watering ponds can be constructed on some of the minor soils.

The scattered areas of coniferous woodland and grassland provide excellent habitat for mule deer, gray fox, bobcat, scrub jay, rufous-sided towhee, red spotted toad, and black-tailed rattlesnake. Proper grazing management is needed to keep the habitat in good condition.

7. Lonti-Manzano-Ustorthents

Nearly level to extremely steep, well drained, deep and moderately deep soils; on hills and terraces

This map unit is on elongated terraces and on rounded hills and mountains. Slope is 0 to 60 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 48 to 55 degrees F.

This map unit makes up about 17 percent of the survey area. It is about 52 percent Lonti and similar soils, 10 percent Manzano and similar soils, and 10 percent Ustorthents and similar soils. The remaining 28 percent is soils of minor extent.

Lonti soils are deep and are on hills. The surface layer is brown gravelly loam, the subsoil is brown and reddish brown gravelly clay and gravelly clay loam, and the substratum is reddish yellow gravelly sandy clay loam.

Manzano soils are deep and are on valley terraces. The surface layer is brown loam, and the subsoil and substratum are brown clay loam.

Ustorthents are deep and moderately deep. They are on hills. No single profile is typical of Ustorthents, but in one commonly observed in this unit the surface layer is brown loam and the underlying material is brown very gravelly loam.

Of minor extent in this unit are deep Paymaster, Ellicott, and similar soils in upland valleys and on valley sides, moderately deep Abrazo soils on hills, shallow Boysag and Santana soils and Lithic Ustorthents on hills and mountains, and deep Ruidoso, Judd, and Guy soils on alluvial fans and hills. All of these soils are well drained.

This unit is used mainly for livestock grazing and wildlife habitat. Steepness of slope and depth to bedrock are the main limitations for most uses. Overgrazing is a major management concern because it leaves the soils in this unit subject to water erosion and gullying and results in an increase in the number of undesirable plants.

The scattered areas of grassland vegetation and shrubs on this unit support wildlife such as mule deer, desert cottontail, kangaroo rat, ground squirrel, and black-tailed jackrabbit. Proper grazing management is needed to keep the habitat in good condition.

8. Jonale-Guy

Moderately sloping to very steep, well drained, deep soils; on hills and ridges

This map unit is on hills and ridges. Slope is 5 to 35 percent. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 48 to 55 degrees F.

This unit makes up about 2 percent of the survey area. It is about 40 percent Jonale soils and 33 percent Guy soils. The remaining 27 percent is soils of minor extent.

Jonale soils are on hills. The surface layer is dark grayish brown sandy clay loam, and the underlying material is grayish brown and pale brown sandy clay loam.

Guy soils are on hills and ridges. The surface layer is dark grayish brown very cobbly loam, and the underlying material is light gray gravelly loam, gravelly sandy loam, and gravelly loamy sand.

Of minor extent in this unit are shallow Boysag, Muzzler, and Santana soils on hillsides, deep Manzano and similar soils in upland drainageways, and Orthents and similar soils along eroded ridges and hillsides. All of these soils are well drained.

This unit is used mainly for livestock grazing and wildlife habitat. Steepness of slope and a high content of calcium carbonate are the major limitations. Overgrazing is a major management concern because it leaves the soils in this unit subject to soil blowing and gullying and results in an increase in the number of undesirable plants.

The intermingled small areas of grassland and coniferous forest in this unit provide habitat for mule deer, woodland cottontail, porcupine, gray fox, chickadee, woodpecker, and other associated species. Populations generally are low because the plant community is deteriorated.

9. Santana-Rock outcrop-Lithic Ustorthents

Gently sloping to very steep, well drained, shallow soils, and Rock outcrop; on hills and mountains

This map unit is on broad hills and mountains that have some long and narrow ridges and ledges. Slope is 1 to 65 percent. Elevation is 5,000 to 8,000 feet. The average annual precipitation is 12 to 16 inches, and the

average annual air temperature is 48 to 55 degrees F.

This unit makes up about 5 percent of the survey area. It is about 40 percent Santana soils, 24 percent Rock outcrop, and 11 percent Lithic Ustorthents and similar soils. The remaining 25 percent is soils of minor extent.

Santana soils are on hills. The surface layer is dark grayish brown loam, and the underlying material is dark grayish brown gravelly loam.

Rock outcrop consists of exposures of rock.

Lithic Ustorthents are on hills and mountains. No single profile is typical of Lithic Ustorthents, but in one commonly observed in this unit the surface layer is brown loam and the underlying material is yellowish brown gravelly loam.

Of minor extent in this unit are shallow Boysag soils and Santa Fe and similar soils on hillsides; moderately deep Abrazo, Carnero, and similar soils on hillsides and ridges; deep Lonti soils on mesas and hills; and deep Manzano and similar soils in alluvial valleys. All of these soils are well drained.

This unit is used mainly for livestock grazing and wildlife habitat. It is also used as woodland. Steepness of slope, the hazard of erosion, and depth to rock are the major limitations for most uses. Overgrazing leaves the soils in this unit subject to soil blowing and gullying and results in an increase in the number of undesirable plants.

The areas of woodland and grassland in this unit provide excellent habitat for many woodland wildlife species. The habitat has deteriorated because of improper grazing management, however, and wildlife populations are low.

10. Santa Fe-Rock outcrop-Encierro

Nearly level to very steep, well drained, shallow and deep soils, and Rock outcrop; on hills

This map unit is on hills that are broad and irregularly shaped (fig. 3). Slope is 0 to 45 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 48 to 55 degrees F.

This map unit makes up about 5 percent of the survey area. It is about 23 percent Santa Fe soils, 17 percent Rock outcrop, 11 percent Encierro soils, and 9 percent

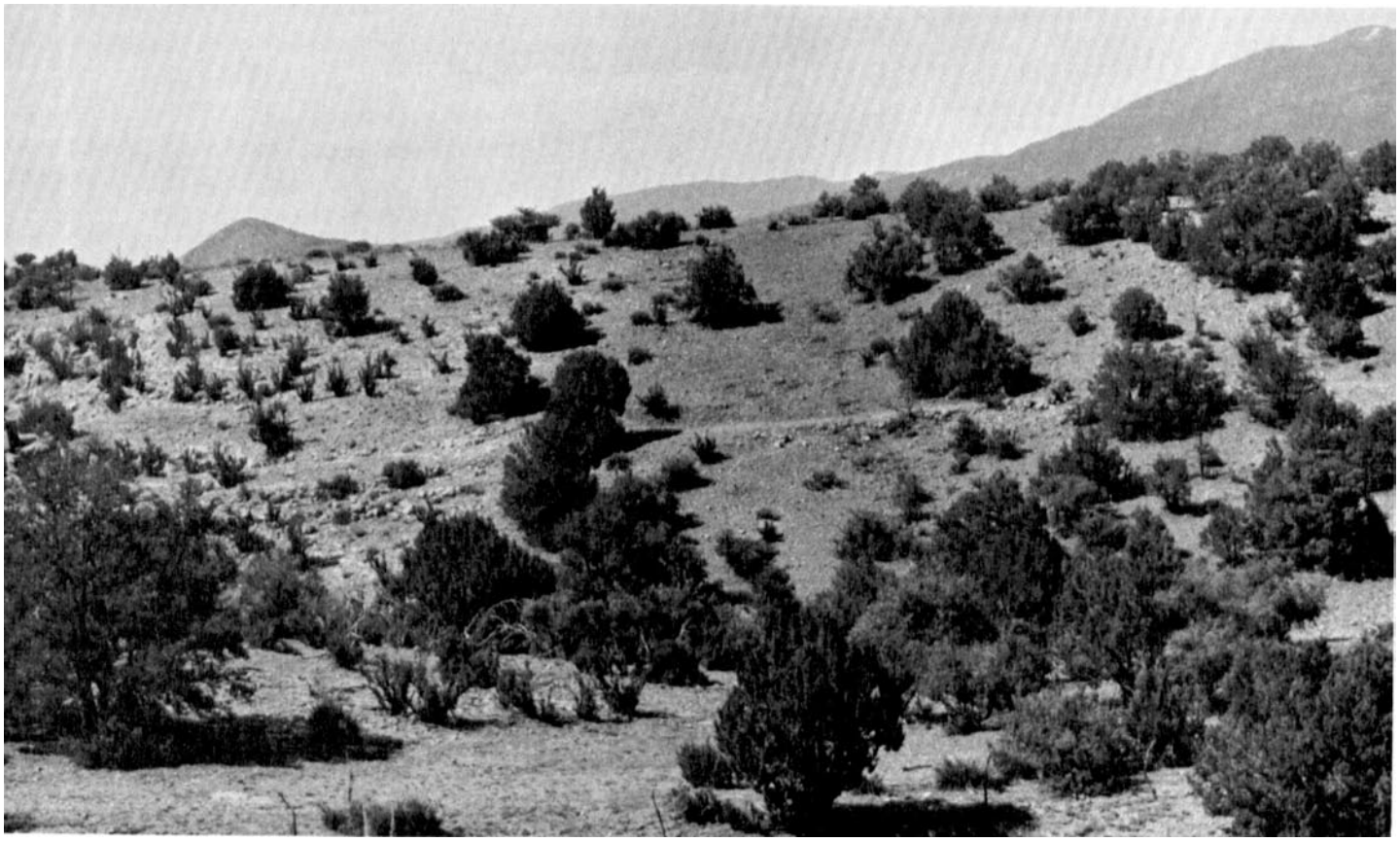

Figure 3.—Typical area of general map unit 10, near Silver City.

Lonti soils. The remaining 40 percent is soils of minor extent.

Santa Fe soils are shallow over igneous rock and have a high content of rock fragments. The surface layer is dark brown gravelly sandy loam, and the subsoil is dark brown very gravelly clay loam.

Rock outcrop consists of barren or nearly barren bedrock.

Encierro soils are shallow over limestone. The surface layer is dark brown gravelly loam, and the subsoil is dark brown and dark reddish brown gravelly clay.

Lonti soils are deep. The surface layer is brown gravelly loam, the subsoil is brown and reddish brown gravelly clay and gravelly clay loam, and the substratum is reddish yellow gravelly sandy clay loam.

Of minor extent in this unit are deep Denver Variant, Gaddes, Lonti, and similar soils on pediment slopes and mesas, deep Manzano and Ruidoso soils on alluvial fans and in valleys, shallow Oro Grande, Abrazo, Boysag, and Santana soils on hillsides, and moderately deep Carnero and Dagflat soils in upland valleys. All of these soils are well drained.

This unit is used mainly for livestock grazing, wildlife habitat, woodland, and urban development. Steepness of slope and depth to bedrock are the major limitations for most uses. Overgrazing is a major management concern because it leaves the soils in this unit subject to soil blowing and gullying and results in an increase in the number of undesirable plants. These soils should be carefully evaluated before they are used for foundations.

The intermingled small areas of grassland and woodland in this unit provide excellent habitat for many woodland wildlife species, including winter range for elk.

11. Plack-Lonti-Pits

Nearly level to very steep, well drained, shallow and deep soils, and Pits; on broad terraces and hills

This map unit is on broad terraces and hills. Slope is 0 to 35 percent. Elevation is 5,300 to 6,000 feet. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 47 to 55 degrees F.

This unit makes up about 2 percent of the survey area. It is about 34 percent Plack soils, 20 percent Lonti soils, 15 percent Pits, and 15 percent Dumps. The remaining 16 percent is soils of minor extent.

Plack soils are shallow and are on broad terraces. The surface layer is brown gravelly loam, the subsoil is brown and reddish brown gravelly clay and gravelly clay loam, and the substratum is reddish yellow gravelly sandy clay loam.

Lonti soils are deep and are on hills. The surface layer is brown gravelly loam, the subsoil is brown and reddish brown gravelly clay and gravelly clay loam, and the substratum is reddish yellow gravelly sandy clay loam.

Pits are open excavations from which soil material has been removed, exposing rock or other material that supports little if any plant life.

Dumps are areas of accumulations of waste rock, mine spoils, and other refuse that support little if any plant life.

Of minor extent in this unit are deep Lonti, Guy, and similar soils on terraces and mesas, deep Paymaster and similar soils along the drainageways, and shallow Plack Variant soils on terraces and ridges. All of these soils are well drained.

This unit is used mainly for livestock grazing, wildlife habitat, and urban development. The major limitations for most uses are depth to caliche and steepness of slope. Overgrazing is a major management concern because it leaves the soils in this unit subject to soil blowing and gullying and results in an increase in the number of undesirable plants. If this unit is used as urban land, pipes should have cathode protection because of the high content of calcium in the soils.

This unit supports Chihuahuan Desert scrub vegetation. Because the unit is used mainly for grazing, its present capacity to support wildlife is well below its potential.

12. Aridic Haplustalfs-Typic Ustorthents

Moderately sloping to extremely steep, well drained, deep and moderately deep soils; on hills and mountains

This map unit consists of broad areas on hills and mountains. Slope is 15 to 80 percent. Elevation is 5,000 to 6,000 feet. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 52 to 57 degrees F.

This unit makes up about 2 percent of the survey area. It is about 45 percent Aridic Haplustalfs and similar soils and 45 percent Typic Ustorthents and similar soils. The remaining 10 percent is components of minor extent.

Aridic Haplustalfs and Typic Ustorthents are loamy and have a high content of rock fragments throughout.

Of minor extent in this unit are well drained Cumulic Haplustolls and Typic Ustipsamments and areas of Riverwash.

This unit is used mainly for livestock grazing, wildlife habitat, and recreation. Steepness of slope is the main limitation for most uses. Overgrazing is a major management concern because it leaves the soils in this unit subject to water erosion and gullying and results in an increase in the number of undesirable plants.

This unit supports scattered shrubs that provide habitat for wildlife such as mule deer, desert cottontail, kangaroo rat, ground squirrel, and black-tailed jackrabbit. Proper grazing management is needed to keep the habitat in good condition.

13. Lithic Haplustalfs-Lithic Haplustalfs, moist-Typic Haplustalfs

Moderately sloping to extremely steep, well drained, shallow and deep soils; on hills and mountains

This map unit consists of broad areas on hills and mountains. Slope is 15 to 80 percent. Elevation is 5,500 to 8,000 feet. The average annual precipitation is 13 to 19 inches, and the average annual air temperature is 48 to 56 degrees F.

This unit makes up about 8 percent of the survey area. It is about 30 percent Lithic Haplustalfs and similar soils; 30 percent Lithic Haplustalfs, moist, and similar soils; and 30 percent Typic Haplustalfs and similar soils. The remaining 10 percent is soils of minor extent.

Lithic Haplustalfs are shallow. These soils are loamy and have a high content of rock fragments throughout.

Lithic Haplustalfs, moist, are shallow. These soils are loamy and have a high content of rock fragments throughout.

Typic Haplustalfs are deep. They are loamy throughout.

Of minor extent in this unit are Lithic Ustorthents; Lithic Ustorthents, moist; Lithic Haploborolls, warm; and Udic Ustochrepts. All of these soils are well drained and are on hills and mountains.

This unit is used mainly for livestock grazing and wildlife habitat and as a source of firewood. Steepness of slope and depth to bedrock are the main limitations for most uses. Overgrazing is a major management concern because it leaves the soils in this unit subject to water erosion and gullying and results in an increase in the number of undesirable plants.

This unit supports woodland and grassland. It has the potential to provide excellent habitat for many woodland wildlife species. The condition of the habitat has deteriorated because of improper grazing management, however, and wildlife populations are low.

Part II. Privately owned land

This part describes the detailed map units in the areas of privately owned land. It discusses the use and management of soils, gives the classification of the soils, and discusses the taxonomic units and their morphology.

Detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, 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, Manzano loam, 0 to 1 percent slopes, is one of several phases in the Manzano series.

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

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Paymaster-Ellicott complex, 1 to 3 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Lonti-Manzano association, 1 to 25 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Riverwash is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 2 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of 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.

Map unit descriptions

1—Abrazo-Luzena complex, 3 to 15 percent slopes. This map unit is on hills, ridges, and benches. Areas are oval in shape and are 300 to 1,000 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 50 percent Abrazo cobbly clay loam, 3 to 15 percent slopes, and 25 percent Luzena cobbly loam, 5 to 15 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Muzzler soils on hills and mountains, Ruidoso soils on alluvial fans and terraces, Manzano soils in valleys and drainageways, and Rock outcrop on ridges and ledges. Included areas make up about 25 percent of the total acreage.

The Abrazo soil is moderately deep and well drained. It formed in residuum derived dominantly from rhyolite and other acid igneous rock. Typically, the surface layer is dark grayish brown cobbly clay loam about 4 inches thick. The upper part of the subsoil is dark brown clay about 20 inches thick, and the lower part is dark yellowish brown gravelly clay about 4 inches thick. Rhyolite is at a depth of 28 inches.

Permeability of the Abrazo soil is slow. Available water capacity is low. Effective rooting depth is 21 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Luzena soil is shallow and well drained. It formed in residuum derived dominantly from andesite and rhyolite. Typically, the surface layer is brown cobbly loam about 3 inches thick. The subsoil is dark brown and reddish brown clay about 9 inches thick. Andesite is at a depth of 12 inches.

Permeability of the Luzena soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly blue grama, sideoats grama, western wheatgrass, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, curlymesquite, tobosa, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,100 pounds per acre in favorable years to 300 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are the depth to rock and clayey texture. Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit.

Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

2—Abrazo-Luzena complex, 15 to 45 percent slopes. This map unit is on hills, mountains, and ridges. Slope is 15 to 45 percent. Areas are oval in shape and are 30 to 350 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Abrazo very cobbly clay loam and 25 percent Luzena gravelly clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Encierro soils on hills; Santa Fe, Santana, and Muzzler soils on hills and ridges; and Rock outcrop on ridges and ledges. Included areas make up about 20 percent of the total acreage.

The Abrazo soil is moderately deep and well drained. It formed in colluvium and residuum derived dominantly from acid igneous rock. Typically, the surface layer is dark grayish brown very cobbly clay loam about 2 inches thick. The subsoil is dark brown, brown, and dark reddish gray clay about 25 inches thick. Acid igneous rock is at a depth of 27 inches.

Permeability of the Abrazo soil is slow. Available water capacity is very low to low. Effective rooting depth is 21 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Luzena soil is shallow and well drained. It formed in colluvium and residuum derived dominantly from acid igneous rock. Typically, the surface layer is dark brown gravelly clay loam about 1 inch thick. The subsoil is dark brown clay about 13 inches thick. Acid igneous rock is at a depth of 14 inches.

Permeability of the Luzena soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and as woodland.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, New Mexico feathergrass, and juniper. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, slope, and clayey texture.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most

efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to juniper and pinyon production. It supports stands with a basal area of about 10 square feet per acre. The potential for post production is fair, and the potential for Christmas trees, pinyon nuts, and firewood production is poor. To prevent deterioration of the woodland, the stands of pinyon and juniper on this unit can be managed for a combination of uses, including firewood production.

3—Anthony fine sandy loam, 1 to 3 percent slopes. This deep and well drained soil is on flood plains. It formed in alluvium derived from mixed sources. Areas are oblong in shape and are 5 to 50 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is pale brown fine sandy loam about 4 inches thick. The substratum to a depth of 60 inches or more is dominantly pale brown and brown fine sandy loam and loamy fine sand, but in places there are thin strata that range from sand to silty clay.

Included in this unit are small areas of Anthony soils that have slopes of 0 to 1 percent, Gila Variant soils on flood plains, and Riverwash along stream channels. Included areas make up about 15 percent of the total acreage.

Permeability of this Anthony soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is subject to rare, very brief periods of flooding from June through September.

Most areas of this unit are used for irrigated crops and pasture. A few areas are used for livestock grazing.

If this unit is used for irrigated crops and pasture, the main limitations are the hazards of soil blowing and flooding. Furrow, border, corrugation, and sprinkler irrigation systems are suited to most crops on this unit. Drip irrigation is suited to orchards. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain organic matter content. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. The risk of flooding can be reduced by the use of dikes, levees, and diversions. Rotation grazing helps to maintain the quality and quantity of forage.

The potential plant community on this unit is mainly giant sacaton, alkali sacaton, tobosa, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants decrease and burrograss, threeawn, feather fingergrass, and mat muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 3,000 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are the hazard of soil blowing, droughtiness, low precipitation, and the hazard of flooding.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to windbreaks and environmental plantings. The main limitations are the hazards of soil blowing and flooding. The hazard of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are blue spruce, Rocky Mountain juniper, and Russian-olive. Among the shrubs are autumn-olive and desertwillow.

4—Boysag clay loam, 15 to 35 percent slopes. This shallow and well drained soil is on hills. It formed in residuum derived dominantly from conglomerate. Areas are elongated in shape and are 20 to 1,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is reddish brown clay loam about 2 inches thick. The subsoil is reddish brown clay and gravelly clay about 12 inches thick. Strongly cemented conglomerate is at a depth of 14 inches.

Included in this unit are small areas of Lonti soils on hills and ridges, Denver Variant soils on hills, Plack Variant soils on ridges, and Manzano soils along drainageways. Included areas make up about 15 percent of the total acreage.

Permeability of the Boysag soil is slow. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, sand dropseed, hairy grama, and Hall panicum, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from

1,100 pounds per acre in favorable years to 375 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, slope, and clayey texture.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to urban development. The main limitations are depth to rock, slope, low soil strength, and high shrink-swell potential. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

5—Boysag-Abrazo-Santana complex, 3 to 20 percent slopes. This map unit is on hills and ridges. Areas are oval in shape and are 100 to 5,000 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 35 percent Boysag sandy clay loam, 3 to 20 percent slopes; 30 percent Abrazo sandy loam, 3 to 20 percent slopes; and 15 percent Santana sandy loam, 5 to 15 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Manzano soils in upland valleys, Lonti and Santa Fe soils on hills, and Rock outcrop on side slopes, ledges, and ridges. Included areas make up about 20 percent of the total acreage.

The Boysag soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from conglomerate and igneous rock. Typically, the surface layer is dark brown sandy clay loam about 3 inches thick. The subsoil is reddish brown clay loam about 15 inches thick. Igneous rock is at a depth of 18 inches.

Permeability of the Boysag soil is slow. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Abrazo soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from acid igneous rock. Typically, the surface layer is brown sandy loam about 10 inches thick. The subsoil is reddish brown clay about 15 inches thick. Acid igneous rock is at a depth of 25 inches.

Permeability of the Abrazo soil is slow. Available water capacity is low. Effective rooting depth is 21 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Santana soil is shallow and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is dark brown sandy loam about 4 inches thick. The substratum is dark brown sandy clay loam about 10 inches thick. Acid igneous rock is at a depth of about 14 inches.

Permeability of the Santana soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 16 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing.

The potential plant community on the Boysag soil is mainly sideoats grama, black grama, blue grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, sand dropseed, hairy grama, and Hall panicum, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,100 pounds per acre in favorable years to 375 pounds in unfavorable years.

The potential plant community on the Abrazo and Santana soils is mainly sideoats grama, blue grama, black grama, and plains lovegrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, slope, and the hazard of soil blowing.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

6—Bucklebar-Sonoita-Continental association, 1 to 8 percent slopes. This map unit is mainly on plains and alluvial fans and in drainageways. Areas are irregular in shape and are 50 to 5,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 40 percent Bucklebar sandy loam, 1 to 5 percent slopes; 30 percent Sonoita loamy sand, 1 to 8

percent slopes; and 15 percent Continental sandy loam, 1 to 2 percent slopes. The Bucklebar soil is on plains and alluvial fans, the Sonoita soil is on alluvial fans, and the Continental soil is in drainageways and depressional areas.

Included in this unit are small areas of Stellar soils on plains and in depressional areas, Mohave soils on uplands, and Tres Hermanos soils on plains and fans. Included areas make up about 15 percent of the total acreage.

The Bucklebar soil is deep and well drained. It formed in alluvium derived dominantly from mixed igneous and sedimentary rock. Typically, the surface layer is brown sandy loam about 3 inches thick. The subsoil is reddish brown clay loam and sandy clay loam about 31 inches thick. The substratum to a depth of 60 inches or more is reddish brown sandy clay loam.

Permeability of the Bucklebar soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Sonoita soil is deep and well drained. It formed in alluvium derived from mixed igneous and sedimentary rock. Typically, the surface layer is brown loamy sand about 4 inches thick. The subsoil is brown sandy loam about 41 inches thick. The substratum to a depth of 60 inches or more is light brown gravelly loamy sand.

Permeability of the Sonoita soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is very high.

The Continental soil is deep and well drained. It formed in alluvium derived from mixed igneous and sedimentary rock. Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is reddish brown and light reddish brown sandy clay and clay about 32 inches thick. The substratum to a depth of 60 inches or more is light reddish brown silty clay loam.

Permeability of the Continental soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly black grama, mesa dropseed, sand dropseed, and plains bristlegrass. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, threeawn, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 700 pounds per acre in favorable years to 250 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are the hazards of soil blowing and seepage and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

7—Carnero-Santa Fe complex, 5 to 15 percent slopes. This map unit is on ridges, hills, and valley sides. Areas are irregular in shape and are 10 to 200 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 40 percent Carnero fine sandy loam, 5 to 8 percent slopes, and 30 percent Santa Fe gravelly sandy loam, 5 to 15 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Manzano soils on valley bottoms and valley sides, Santana and Dagflat soils on ridgetops and valley sides, and Rock outcrop on ridges and ledges. Included areas make up about 30 percent of the total acreage.

The Carnero soil is moderately deep and well drained. It formed in residuum derived from shale and sandstone and mixed with local alluvium. Typically, the surface layer is brown fine sandy loam about 3 inches thick. The subsoil is brown clay loam and silty clay loam about 31 inches thick. Weathered sandstone is at a depth of 34 inches.

Permeability of the Carnero soil is slow. Available water capacity is moderate. Effective rooting depth is 25 to 34 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Santa Fe soil is shallow and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is dark brown gravelly sandy loam about 3 inches thick. The subsoil is dark brown very gravelly loam and very gravelly clay loam about 15 inches thick. Acid igneous rock is at a depth of 18 inches.

Permeability of the Santa Fe soil is moderate. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing and urban development.

The potential plant community on the Carnero soil is mainly blue grama, sideoats grama, black grama, and tobosa. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, broom snakeweed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 875 pounds per acre in favorable years to 300 pounds in unfavorable years.

The potential plant community on the Santa Fe soil is mainly black grama, New Mexico feathergrass, sideoats grama, and blue grama. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, ring muhly, and sand dropseed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock and rock fragments in the soils.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are depth to rock, slope, and shrink-swell potential. If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

8—Conger gravelly loam, 0 to 5 percent slopes. This shallow and well drained soil is on old alluvial terraces and alluvial fans. It formed in alluvium derived from mixed sources. Areas are elongated in shape and are 50 to 1,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is grayish brown gravelly loam about 2 inches thick. The next layer is brown clay loam about 11 inches thick. Indurated caliche is at a depth of 13 inches.

Included in this unit are small areas of Stellar and Mohave soils in depressional areas and on alluvial fans and a soil, on alluvial fans and terraces, that is similar to this Conger soil but is underlain by moderately cemented caliche. Included areas make up about 15 percent of the total acreage.

Permeability of the Conger soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly bush muhly, black grama, Arizona cottontop, and creosotebush. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, sand dropseed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 500 pounds per acre in favorable years to 125 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to indurated caliche, droughtiness, and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

9—Conger-Stellar association, 0 to 5 percent slopes. This map unit is on upland ridges and alluvial fans and in depressional areas and drainageways. Areas are irregular in shape and are 50 to 1,200 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 60 percent Conger fine sandy loam, 0 to 5 percent slopes, and 30 percent Stellar sandy clay loam, 0 to 2 percent slopes. The Conger soil is on upland ridges and alluvial fans, and the Stellar soil is on alluvial fans and in depressional areas and along drainageways.

Included in this unit are small areas of Mimbres soils on plains and in playas and Mohave and Tres Hermanos soils on alluvial fans. Included areas make up about 10 percent of the total acreage.

The Conger soil is shallow and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark grayish brown fine sandy loam about 1 inch thick. The subsurface layer is dark grayish brown sandy clay loam about 5 inches thick. The substratum is brown gravelly clay loam about 4 inches thick. Indurated caliche is at a depth of about 10 inches.

Permeability of the Conger soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Stellar soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is light brown sandy clay loam about 6 inches thick. The subsoil is reddish brown clay loam about 20 inches thick. The substratum to a depth of 60 inches or more is light reddish brown clay loam.

Permeability of the Stellar soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on the Conger soil is mainly bush muhly, black grama, Arizona cottontop, and creosotebush. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, sand dropseed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 500 pounds per acre in favorable years to 125 pounds in unfavorable years.

The potential plant community on the Stellar soil is mainly black grama, bush muhly, tobosa, and sand dropseed. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, burrograss, ring muhly, and fluffgrass, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 600 pounds per acre in favorable years to 200 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to caliche in the Conger soil, clayey texture, and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

10—Continental-Nickel association, 0 to 15 percent slopes. This map unit is on dissected pediments, plains, and alluvial fans. Areas are elongated in shape and are 50 to 1,500 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 50 percent Continental sandy clay loam, 0 to 2 percent slopes, and 30 percent Nickel gravelly sandy loam, 2 to 15 percent slopes. The Continental soil is on plains and alluvial fans, and the Nickel soil is on alluvial fans and pediments.

Included in this unit are small areas of Tres Hermanos soils on plains and alluvial fans, Riverwash in stream channels, and Orthids on ridges. Included areas make up about 20 percent of the total acreage.

The Continental soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is reddish brown sandy clay loam about 5 inches thick. The subsoil is reddish brown and yellowish red clay loam and clay about 19 inches thick. The substratum to a depth of 60 inches or more is pink and reddish brown gravelly sandy clay loam.

Permeability of the Continental soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Nickel soil is deep and well drained. It formed in old alluvium derived from mixed sources. Typically, the surface layer is pinkish gray gravelly sandy loam about 8 inches thick. The subsoil is pinkish gray gravelly sandy loam about 11 inches thick. The substratum to a depth of 60 inches or more is pinkish gray very gravelly loamy sand.

Permeability of the Nickel soil is moderately slow. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing.

The potential plant community on the Continental soil is mainly tobosa, black grama, alkali sacaton, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, burrograss, mat muhly, and mesquite, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 675 pounds per acre in favorable years to 275 pounds in unfavorable years.

The potential plant community on the Nickel soil is mainly bush muhly, black grama, creosotebush, and Arizona cottontop. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, sand dropseed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 500 pounds per acre in favorable years to 125 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are the clayey texture of the Continental soil, slope, the high content of lime in the Nickel soil, and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and water

development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

11—Dagflat-Santa Fe complex, 1 to 25 percent slopes. This map unit is in intraridge valleys and on hills. Areas are irregular in shape and are 10 to 250 acres in size. The native vegetation is mainly grasses, forbs, and shrubs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 45 percent Dagflat loam, 1 to 15 percent slopes, and 30 percent Santa Fe gravelly sandy loam, 5 to 25 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Santana soils on hills and ridges, Manzano soils on valley bottoms, Carnero soils in intraridge valleys and on valley sides, and Rock outcrop on ridges and ledges. Included areas make up about 25 percent of the total acreage.

The Dagflat soil is moderately deep and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is brown loam about 8 inches thick. The subsoil is brown and dark reddish gray sandy clay loam and gravelly sandy clay loam about 23 inches thick. Acid igneous rock is at a depth of 31 inches.

Permeability of the Dagflat soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 21 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Santa Fe soil is shallow and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is dark brown gravelly sandy loam about 2 inches thick. The subsoil is dark brown very gravelly loam and very gravelly clay loam about 16 inches thick. Acid igneous rock is at a depth of 18 inches.

Permeability of the Santa Fe soil is moderate. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing and urban development.

The potential plant community on the Dagflat soil is mainly sideoats grama, blue grama, black grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

The potential plant community on the Santa Fe soil is mainly sideoats grama, blue grama, black grama, and plains lovegrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are slope, rock fragments in the soils, and depth to rock. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

12—Encierro-Rock outcrop complex, 8 to 30 percent slopes. This map unit is on hills and ridges. Areas are oval in shape and are 50 to 4,000 acres in size. The native vegetation is mainly pinyon, juniper, and grasses. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Encierro gravelly loam, 8 to 30 percent slopes, and 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Oro Grande soils on hills, Manzano soils in valleys, Ruidoso soils on terraces and alluvial fans, and Santa Fe soils on hills. Included areas make up about 20 percent of the total acreage.

The Encierro soil is shallow and well drained. It formed in residuum derived dominantly from limestone. Typically, the surface layer is dark brown gravelly loam about 2

inches thick. The subsoil is dark brown gravelly clay about 7 inches thick. Limestone is at a depth of 9 inches.

Permeability of the Encierro soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Rock outcrop consists of barren or nearly barren bedrock.

This unit is used for livestock grazing and as woodland.

The potential plant community on the Encierro soil in this unit is mainly sideoats grama, juniper, blue grama, black grama, and plains lovegrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are areas of Rock outcrop, depth to rock of the Encierro soil, and slope.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is well suited to pinyon and juniper production. It supports stands with a basal area of about 70 square feet per acre. The potential for firewood production is excellent, and the potential for Christmas trees, pinyon nuts, mine supports, and fenceposts is good. To prevent deterioration of the woodland, the stands of pinyon and juniper on this unit can be managed for a combination of uses, including firewood production.

13—Encierro-Rock outcrop complex, 15 to 35 percent slopes. This map unit is on hills and ridges. Areas are oval in shape and are 10 to 600 acres in size. The native vegetation is mainly pinyon, juniper, and grasses. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 45 percent Encierro gravelly loam, 15 to 35 percent slopes, and 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Oro Grande soils on hills, Manzano soils in valleys, Ruidoso soils on terraces and alluvial fans, and Santa Fe soils on hills. Also included are small areas of Encierro soils that have slopes of 5 to 15 percent. Included areas make up about 30 percent of the total acreage.

The Encierro soil is shallow and well drained. It formed in residuum derived dominantly from limestone. Typically, the surface layer is dark brown gravelly loam about 2 inches thick. The subsoil is dark brown and dark reddish brown gravelly clay about 7 inches thick. Limestone is at a depth of 9 inches.

Permeability of the Encierro soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Rock outcrop consists of barren or nearly barren bedrock.

This unit is used for livestock grazing and as woodland.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, pinyon, plains lovegrass, and juniper. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are areas of Rock outcrop, depth to rock of the Encierro soil, and slope.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is well suited to pinyon and juniper production. It supports stands with a basal area of about 80 square feet per acre. The potential for firewood production is excellent, and the potential for Christmas trees, pinyon nuts, mine supports, and fenceposts is good. To prevent deterioration of the woodland, the stands of pinyon and juniper on this unit can be managed for a combination of uses, including firewood production.

14—Gaddes-Ruidoso complex, 3 to 15 percent slopes. This map unit is on the sides of ridges and on alluvial fans. Areas are irregular in shape and are 10 to 200 acres in size. The native vegetation is mainly

grasses and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 50 percent Gaddes gravelly sandy loam, 5 to 15 percent slopes, and 35 percent Ruidoso clay loam, 3 to 8 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Santa Fe soils on hills and ridges, Rock outcrop on ridges and ledges, Manzano soils in valleys, and Riverwash in stream channels. Included areas make up about 15 percent of the total acreage.

The Gaddes soil is moderately deep and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is brown gravelly sandy loam about 2 inches thick. The subsoil is brown and strong brown gravelly sandy clay loam about 20 inches thick. Weathered granite is at a depth of 22 inches.

Permeability of the Gaddes soil is moderately slow. Available water capacity is very low to low. Effective rooting depth is 30 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Ruidoso soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark grayish brown clay loam about 3 inches thick. The upper part of the subsoil is dark grayish brown, brown, and pale brown clay about 47 inches thick, and the lower part to a depth of 60 inches or more is yellowish brown sandy clay.

Permeability of the Ruidoso soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and urban development.

The potential plant community on the Gaddes soil is mainly sideoats grama, blue grama, black grama, and plains lovegrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

The potential plant community on the Ruidoso soil is mainly blue grama, sideoats grama, black grama, and tobosa. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, broom snakeweed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 875 pounds per acre in favorable years to 300 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock of the Gaddes soil and the clayey texture of the Ruidoso soil.

Range management practices such as deferred-rotation grazing, proper grazing use, and water management are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is suited to urban development. The main limitations are slope, the clayey texture of the Ruidoso soil, shrink-swell potential, and depth to rock of the Gaddes soil. If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

15—Gaddes-Santa Fe-Rock outcrop complex, 15 to 45 percent slopes. This map unit is on ridges and hills. Areas are irregular in shape and are 10 to 100 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Gaddes gravelly sandy loam, 15 to 35 percent slopes; 15 percent Santa Fe gravelly sandy loam, 15 to 45 percent slopes; and 15 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Santana soils on ridges, Manzano soils in valleys, Carnero soils on hills, and Riverwash in drainage channels. Included areas make up about 15 percent of the total acreage.

The Gaddes soil is moderately deep and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is brown gravelly sandy loam about 2 inches thick. The subsoil is brown and strong brown gravelly sandy clay loam about 20 inches thick. Weathered granite is at a depth of 22 inches.

Permeability of the Gaddes soil is moderately slow. Available water capacity is very low to low. Effective rooting depth is 30 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Santa Fe soil is shallow and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is dark brown gravelly sandy loam about 2 inches thick. The subsoil is dark brown very gravelly loam and very gravelly clay loam about 16 inches thick. Acid igneous rock is at a depth of 18 inches.

Permeability of the Santa Fe soil is moderate. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

Rock outcrop consists of barren or nearly barren bedrock.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, New Mexico feathergrass, and juniper. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, slope, and rock fragments in the soils.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to urban development. The main limitations are depth to rock, rock fragments in the soils, and slope. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

16—Gila Variant fine sandy loam, 1 to 3 percent slopes. This deep and well drained soil is on flood plains, alluvial fans, and side slopes. It formed in alluvium derived from mixed sources. Areas are oblong in shape and are 5 to 50 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the upper 8 inches of the surface layer is pale brown fine sandy loam, and the lower 6 inches is light gray loam. The substratum to a depth of 60 inches or more is stratified, light yellowish brown silty clay loam and pale brown sandy clay loam, silty clay loam, and fine sandy loam.

Included in this unit are small areas of Anthony soils on flood plains, Gila Variant soils that have slopes of 0 to 1 percent, and Arizo soils on alluvial fans. Included areas make up about 15 percent of the total acreage.

Permeability of the Gila Variant soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slight, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to occasional, very brief periods of flooding from April through October.

This unit is used for irrigated crops and pasture and for livestock grazing and windbreaks.

If this unit is used for irrigated crops and pasture, the main limitations are the hazards of soil blowing and flooding. Furrow, border, corrugation, and sprinkler irrigation systems are suited to most crops on this unit. Drip irrigation is suited to orchards. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. The risk of flooding can be reduced by the use of levees, dikes, and diversions. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage.

The potential plant community on this unit is mainly giant sacaton, alkali sacaton, tobosa, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants decrease and burrograss, threeawn, feather fingergrass, and mat muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 3,000 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are the hazard of soil blowing, droughtiness, the hazard of flooding, and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to windbreaks and environmental plantings. The main limitations are the hazards of flooding and soil blowing. Soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are Arizona cypress and blue spruce. Among the shrubs are American plum and autumn-olive.

17—Guy very cobbly loam, 15 to 35 percent slopes. This deep and well drained soil is on ridges and hills. It formed in old alluvium and eolian material derived dominantly from conglomerate. Areas are irregular in shape and are 10 to 800 acres in size. The native vegetation is mainly grasses, forbs, and shrubs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is dark grayish brown very cobbly loam about 8 inches thick. The next layer, to a depth of 31 inches, is light gray gravelly sandy loam and gravelly loam. Below this to a depth of 60 inches or more is gravelly loamy sand.

Included in this unit are small areas of Lonti soils on ridges and hills, Plack Variant soils on old terraces and ridges, and Manzano soils on valley bottoms. Included areas make up about 15 percent of the total acreage.

Permeability of this Guy soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, sand dropseed, hairy grama, and Hall panicum, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,100 pounds per acre in favorable years to 375 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are slope, rock fragments on the surface, and the high content of lime in the soil.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to urban development. The main limitations are rock fragments on the surface and slope. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

18—Guy-Lonti complex, 3 to 15 percent slopes. This map unit is on hills. Areas are irregular in shape and are 50 to 1,800 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Guy gravelly loam, 5 to 15 percent slopes, and 25 percent Lonti gravelly sandy clay loam, 3 to 15 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Manzano soils in valleys, San Mateo soils on flood plains, Ustorthents on the sides of eroded hills and ridges, and Ruidoso soils on alluvial fans. Included areas make up about 20 percent of the total acreage.

The Guy soil is deep and well drained. It formed in old alluvium derived dominantly from conglomerate. Typically, the surface layer is brown gravelly loam about 8 inches thick. The substratum to a depth of 60 inches or more is light reddish brown and pink sandy loam, gravelly sandy loam, and loam.

Permeability of the Guy soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Lonti soil is deep and well drained. It formed in old alluvium derived dominantly from conglomerate. Typically, the surface layer is brown gravelly sandy clay loam about 6 inches thick. The subsoil is reddish brown clay about 19 inches thick. The substratum to a depth of 60 inches or more is reddish brown gravelly clay loam and gravelly sandy clay loam.

Permeability of the Lonti soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly black grama, blue grama, sideoats grama, tobosa, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact

between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

19—Haverson silty clay loam, 0 to 1 percent slopes. This deep and well drained soil is on flood plains and stream terraces. It formed in alluvium derived from mixed sources. Areas are irregular in shape and are 10 to 250 acres in size. The native vegetation is mainly grasses. Elevation is 5,000 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is pale brown silty clay loam about 2 inches thick. The substratum to a depth of 60 inches or more is pale brown silt loam and silty clay loam with thin strata of loamy sand and sand.

Included in this unit are small areas of eroded Haverson soils; Manzano, Paymaster, Ellicott, and Stirk Variant soils on flood plains; and Haverson soils that are saline-alkali. Included areas make up about 20 percent of the total acreage.

Permeability of this Haverson soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare, very brief periods of flooding from July through September.

Most areas of this unit are used for irrigated crops and pasture. A few areas are used for livestock grazing and windbreaks.

If this unit is used for irrigated crops and pasture, the main limitations are the hazards of soil blowing and flooding and the clayey texture. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. The risk of flooding can be reduced by the use of levees, dikes, and diversions. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage. Timely harvesting improves the quality of crops.

The potential plant community on this unit is mainly giant sacaton, vine-mesquite, western wheatgrass, and alkali sacaton. As the plant community deteriorates, the more desirable forage plants decrease and tobosa, threeawn, burrograss, and fluffgrass, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 4,000 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are the hazard of soil blowing and clayey texture.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is moderately well suited to windbreaks and environmental plantings. The main limitation is the hazard of soil blowing. Soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are white fir and Arizona cypress. Among the shrubs is American plum.

20—Hondale-Verhalen association, 0 to 3 percent slopes. This map unit is on alluvial flats, on valley bottoms and valley basin floors, and in bolsons. Areas are elongated in shape and are 300 to 2,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 70 percent Hondale sandy loam, 0 to 3 percent slopes, and 20 percent Verhalen silty clay, 0 to 1 percent slopes. The Hondale soil is on alluvial flats and bolson rims, and the Verhalen soil is on valley bottoms, in bolsons, and on valley basin floors.

Included in this unit are small areas of Mimbres soils on plains and in playas, Stellar soils on plains, and Mohave soils on alluvial fans. Included areas make up about 10 percent of the total acreage.

The Hondale soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is light brown sandy loam about 5 inches thick. The subsurface layer is pinkish gray sandy clay loam and clay loam about 5 inches thick. The subsoil is pink and brown clay loam and clay about 16 inches thick. The substratum to a depth of 60 inches or more is light brown and pinkish white clay loam, sandy clay, and sandy clay loam.

Permeability of the Hondale soil is very slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. The content of exchangeable sodium ranges from 15 to 50 percent. This soil is subject to rare, very brief periods of flooding in July through September.

The Verhalen soil is deep and moderately well drained. It formed in alluvium and lacustrine sediment derived from mixed sources. Typically, the surface layer is pinkish gray silty clay about 10 inches thick. The

substratum to a depth of 60 inches or more is brown clay.

Permeability of the Verhalen soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare, very brief periods of flooding in July through September.

This unit is used for livestock grazing.

The potential plant community on the Hondale soil is mainly alkali sacaton, black grama, giant sacaton, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, burrograss, and tobosa, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,500 pounds per acre in favorable years to 400 pounds in unfavorable years.

The potential plant community on the Verhalen soil is mainly tobosa, alkali sacaton, vine-mesquite, and giant sacaton. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, burrograss, and mat muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 2,500 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are the high sodium content of the Hondale soil, clayey texture, the hazard of soil blowing, and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

21—Jonale sandy clay loam, 15 to 35 percent slopes. This deep and well drained soil is on hills. It formed in old alluvium derived from conglomerate. Areas are irregular in shape and are 100 to 6,000 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is dark grayish brown sandy clay loam about 10 inches thick. The substratum to a depth of 60 inches or more is pale brown and grayish brown sandy clay loam.

Included in this unit are small areas of Guy soils on hills and ridges, Manzano soils in valleys, Lonti soils on hills, and Jonale soils that have a cobbly surface layer. Included areas make up about 15 percent of the total acreage.

Permeability of the Jonale soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, sand dropseed, hairy grama, and Hall panicum, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,100 pounds per acre in favorable years to 375 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are slope and high lime content.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to urban development. The main limitations are high lime content and slope. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

22—Judd-Manzano association, 1 to 15 percent slopes. This map unit is on plains and hills and in valleys. Areas are elongated in shape and are 50 to 3,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,000 to 6,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 70 percent Judd loam, 2 to 15 percent slopes, and 15 percent Manzano gravelly loam, 1 to 5 percent slopes. The Judd soil is on hills and plains, and the Manzano soil is in valleys and on plains.

Included in this unit are small areas of Lonti soils on hills and Ruidoso soils on old alluvial terraces. Included areas make up about 15 percent of the total acreage.

The Judd soil is deep and well drained. It formed in residuum and old alluvium derived from conglomerate. Typically, the surface layer is grayish brown loam about 2 inches thick. The subsoil is grayish brown clay loam and clay about 16 inches thick. The substratum to a depth of 60 inches or more is light brown loam.

Permeability of the Judd soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Manzano soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown gravelly loam about 15 inches thick. The subsoil is very dark grayish brown clay loam about 20 inches thick. The substratum to a depth of 60 inches or more is grayish brown sandy loam.

Permeability of the Manzano soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, New Mexico feathergrass, and tobosa. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

23—Lehmans-Lithic Haplargids complex, 5 to 15 percent slopes. This map unit is on hills. Areas are irregular in shape and are 100 to 2,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 40 percent Lehmans gravelly sandy clay loam and 35 percent Lithic Haplargids. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Mimbres soils on plains and a moderately deep soil on plains and in depressional areas. Included areas make up about 25 percent of the total acreage.

The Lehmans soil is shallow and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is strong brown gravelly sandy clay loam about 1 inch thick. The subsoil is dark brown clay about 14 inches thick. Acid igneous rock is at a depth of 15 inches.

Permeability of the Lehmans soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Lithic Haplargids are shallow and well drained. They formed in residuum and colluvium derived dominantly from igneous rock. Lithic Haplargids are variable in their characteristics. No single profile is typical of these soils.

Permeability of the Lithic Haplargids is moderately slow to moderately rapid. Available water capacity is very low. Effective rooting depth is 5 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly black grama, bush muhly, sideoats grama, and Metcalfe muhly. As the plant community deteriorates, the more desirable forage plants decrease and broom snakeweed, threeawn, and buckwheat, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 750 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, clayey texture, and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

24—Lithic Haplargids-Rock outcrop association, 15 to 75 percent slopes. This map unit is on hills, ridges, ledges, and escarpments. Slope is 15 to 75 percent. Areas are oval in shape and are 300 to 10,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 70 percent Lithic Haplargids, 15 to 75 percent slopes, and 15 percent Rock outcrop. Lithic

Haplargids are on hills and ridges, and Rock outcrop is on ledges, escarpments, and ridges.

Included in this unit are small areas of Tres Hermanos soils on alluvial fans and terraces, Nickel soils on hills, and Upton soils on alluvial fans. Included areas make up about 15 percent of the total acreage.

The Lithic Haplargids are shallow and well drained. They formed in residuum derived from mixed sources. Lithic Haplargids are variable in their characteristics. No single profile is typical of these soils.

Permeability of the Lithic Haplargids is moderately slow to moderately rapid. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate to high.

Rock outcrop consists of barren or nearly barren bedrock.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly black grama, bush muhly, sideoats grama, and Metcalfe muhly. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, broom snakeweed, and buckwheat, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 750 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are slope, depth to rock, and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and trails are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

25—Lonti gravelly loam, 15 to 35 percent slopes. This deep and well drained soil is on hills and pediments. It formed in old alluvium derived dominantly from conglomerate. Areas are elongated in shape and are 50 to 1,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is reddish brown and brown gravelly clay about 19 inches thick. The substratum to a depth of 60 inches or more is reddish yellow gravelly clay loam and gravelly sandy clay loam.

Included in this unit are small areas of Boysag soils on hills, Manzano soils in valleys, and Guy and Jonale soils on hills. Included areas make up about 15 percent of the total acreage.

Permeability of the Lonti soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Most areas of this unit are used for livestock grazing. A few areas are used for urban development.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, sand dropseed, hairy grama, and Hall panicum, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,100 pounds per acre in favorable years to 375 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are slope and clayey texture.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to urban development. The main limitations are slope, clayey texture, and shrink-swell potential. If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

26—Lonti gravelly clay loam, 0 to 8 percent slopes. This deep and well drained soil is on hills. It formed in old alluvium derived dominantly from conglomerate. Areas are oval in shape and are 20 to 500 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is dark brown gravelly clay loam about 4 inches thick. The subsoil is reddish brown clay about 19 inches thick. The substratum to a depth of 60 inches or more is light brown gravelly sandy loam.

Included in this unit are small areas of Denver Variant soils on hills, Guy soils on ridges and hills, Manzano soils in valleys, and Lonti soils that have slopes of more than 8 percent. Included areas make up about 15 percent of the total acreage.

Permeability of this Lonti soil is slow. Available water capacity is moderate. Effective rooting depth is 60

inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Most areas of this unit are used for livestock grazing and urban development. A few areas are used for irrigated crops and pasture and for windbreaks.

The potential plant community on this unit is mainly blue grama, black grama, sideoats grama, and tobosa. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, burrograss, fluffgrass, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 875 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are shrink-swell potential and clayey texture. If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

If this unit is used for irrigated crops and pasture, the main limitations are slope, the hazards of erosion and soil blowing, and the gravelly surface layer. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing and erosion, and helps to maintain soil tilth and organic matter content. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage.

This unit is suited to windbreaks and environmental plantings. The main limitations are gravel on surface and clayey texture. Soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are Russian-olive and Arizona sycamore. Among the shrubs are autumn-olive and smooth sumac.

27—Lonti-Denver Variant complex, 1 to 25 percent slopes. This map unit is on ridges, hills, and toe slopes. Areas are oval in shape and are 10 to 500 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Lonti gravelly loam, 3 to 25 percent slopes, and 35 percent Denver Variant clay loam, 1 to 9 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Manzano soils in valleys, Boysag soils on hills, and Paymaster soils on valley bottoms. Included areas make up about 10 percent of the total acreage.

The Lonti soil is deep and well drained. It formed in old alluvium derived dominantly from conglomerate. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is brown and reddish brown gravelly clay and gravelly clay loam about 19 inches thick. The substratum to a depth of 60 inches or more is reddish yellow gravelly sandy clay loam.

Permeability of the Lonti soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Denver Variant soil is deep and well drained. It formed in old alluvium derived dominantly from conglomerate. Typically, the surface layer is dark grayish brown clay loam about 2 inches thick. The subsoil is brown clay about 28 inches thick. The substratum to a depth of 60 inches or more is brown gravelly clay.

Permeability of the Denver Variant soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and urban development.

The potential plant community on the Lonti soil is mainly blue grama, black grama, sideoats grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

The potential plant community on the Denver Variant soil is mainly blue grama, sideoats grama, black grama, and tobosa. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, burrograss, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual

production of air-dry vegetation ranges from 875 pounds per acre in favorable years to 300 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are shrink-swell potential and clayey texture.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are slope, clayey texture, and shrink-swell potential. If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

28—Lonti-Manzano association, 1 to 25 percent slopes. This map unit is on hills and in upland valleys. Areas are elongated in shape and are 200 to 5,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 65 percent Lonti gravelly loam, 3 to 25 percent slopes, and 20 percent Manzano loam, 1 to 5 percent slopes. The Lonti soil is on hills, and the Manzano soil is in valleys.

Included in this unit are small areas of Paymaster soils on valley bottoms, Ellicott soils on flood plains, Ustorthents on eroded hills and ridges, and Ruidoso soils on alluvial fans and terraces. Included areas make up about 15 percent of the total acreage.

The Lonti soil is deep and well drained. It formed in old alluvium derived dominantly from conglomerate. Typically, the surface layer is brown gravelly loam about 4 inches thick. The subsoil is reddish brown clay about 30 inches thick. The substratum to a depth of 60 inches or more is yellowish red gravelly sandy clay loam.

Permeability of the Lonti soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Manzano soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown loam about 15 inches thick. The subsoil is brown clay loam about 11 inches thick. The substratum to a depth of 60 inches or more is dark grayish brown clay loam.

Permeability of the Manzano soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to rare, very brief periods of flooding in July through September.

This unit is used for livestock grazing.

The potential plant community on the Lonti soil is mainly sideoats grama, blue grama, black grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, sand dropseed, hairy grama, and Hall panicum, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

The potential plant community on the Manzano soil is mainly sideoats grama, blue grama, vine-mesquite, black grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

29—Lonti-Ustorthents association, 5 to 60 percent slopes. This map unit is on hills, ridges, and breaks. Areas are oblong in shape and are 150 to 2,500 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 70 percent Lonti gravelly loam, 5 to 35 percent slopes, and 20 percent Ustorthents, 10 to 60 percent slopes. The Lonti soil is on hills, and Ustorthents are on eroded ridges, hills, and breaks.

Included in this unit are small areas of Manzano soils in valleys, Guy and Jonale soils on hills, and Ruidoso soils on terraces and alluvial fans. Included areas make up about 10 percent of the total acreage.

The Lonti soil is deep and well drained. It formed in old alluvium derived dominantly from conglomerate. Typically, the surface layer is very dark grayish brown gravelly loam about 4 inches thick. The subsoil is dark brown gravelly clay about 25 inches thick. The substratum to a depth of 60 inches or more is brown and light yellowish brown gravelly sandy loam and gravelly sandy clay loam.

Permeability of the Lonti soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Ustorthents are moderately deep to deep and are well drained. They formed in old alluvium derived dominantly from conglomerate. Ustorthents are variable in their characteristics. No single profile is typical of these soils.

Permeability of Ustorthents is moderately slow to moderately rapid. Available water capacity is low to high. Effective rooting depth is 30 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate to high.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, sand dropseed, hairy grama, and Hall panicum, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,100 pounds per acre in favorable years to 375 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and trails are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

30—Luzena very gravelly sandy clay loam, 5 to 25 percent slopes. This shallow and well drained soil is on hills. It formed in residuum derived dominantly from rhyolite, tuff, and other igneous rock. Areas are elongated in shape and are 200 to 1,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is dark brown very gravelly sandy clay loam about 4 inches thick. The subsoil is dark brown clay about 11 inches thick. Acid igneous rock is at a depth of 15 inches.

Included in this unit are small areas of Manzano soils in upland valleys, Ruidoso soils on terraces and alluvial fans, Muzzler soils on mountains and hills, and Abrazo soils on hills. Included areas make up about 15 percent of the total acreage.

Permeability of the Luzena soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, and plains lovegrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are slope, depth to rock, and clayey texture.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

31—Luzena-Rock outcrop association, 10 to 35 percent slopes. This map unit is on hills, ledges, ridges, and escarpments. Areas are oblong in shape and are 500 to 7,000 acres in size. The native vegetation is mainly grasses, forbs, and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 65 percent Luzena gravelly loam, 10 to 35 percent slopes, and 20 percent Rock outcrop. The Luzena soil is on hills, and Rock outcrop is on ridges, ledges, and escarpments.

Included in this unit are small areas of Abrazo soils on hills and in saddles, Muzzler soils on hills and mountains, Lithic Ustorthents on hills, and Sanloren soils on terraces. Included areas make up about 15 percent of the total acreage.

The Luzena soil is shallow and well drained. It formed in residuum derived from igneous rock. Typically, the surface layer is dark grayish brown gravelly loam about 2 inches thick. The subsoil is dark grayish brown clay about 14 inches thick. Igneous rock is at a depth of 16 inches.

Permeability of the Luzena soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Rock outcrop consists of barren or nearly barren bedrock.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, and plains lovegrass. As the plant community deteriorates, the more desirable forage plants decrease, and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, clayey texture, and areas of Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

32—Manzano loam, 0 to 1 percent slopes. This deep and well drained soil is on flood plains. It formed in alluvium derived from mixed sources. Areas are irregular in shape and are 2 to 200 acres in size. The native vegetation is mainly grasses. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsoil is very dark grayish brown clay loam about 15 inches thick. The substratum to a depth of 60 inches or more is very dark grayish brown clay loam.

Included in this unit are small areas of Haverson, Paymaster, and Ellicott soils on flood plains, Manzano soils that have a clay loam surface layer, Ruidoso soils on alluvial fans, and Manzano soils that have a high water table. Included areas make up about 15 percent of the total acreage.

Permeability of the Manzano soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to rare, very brief periods of flooding in July through September.

Most areas of this unit are used for irrigated crops and pasture. A few areas are used for livestock grazing, urban development, and windbreaks.

This unit is well suited to irrigated crops and pasture. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit. Drip irrigation is suited to orchards. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. The risk of flooding can be reduced by the use of levees, dikes, and diversions. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage.

The potential plant community on this unit is mainly giant sacaton, western wheatgrass, vine-mesquite, and alkali sacaton. As the plant community deteriorates, the more desirable forage plants decrease and tobosa, threeawn, burrograss, and fluffgrass, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 4,000 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitation is the hazard of rare periods of flooding. Flooding can be controlled only by use of major flood control structures. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is well suited to windbreaks and environmental plantings. The hazard of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are Arizona cypress and green ash. Among the shrubs are American plum and desertwillow.

33—Manzano loam, 1 to 3 percent slopes. This deep and well drained soil is on flood plains and in upland valleys. It formed in alluvium derived from mixed sources. Areas are irregular in shape and are 2 to 400 acres in size. The native vegetation is mainly grasses. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is brown loam about 3 inches thick. The subsoil is brown clay loam about 23 inches thick. The substratum to a depth of 60 inches or more is brown clay loam.

Included in this unit are small areas of Haverson, Paymaster, and Ellicott soils on flood plains; Ruidoso soils on alluvial fans; and Manzano soils that have a high water table. Included areas make up about 15 percent of the total acreage.

Permeability of the Manzano soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to rare, very brief periods of flooding in July through September.

Most areas of this unit are used for irrigated crops. A few areas are used for livestock grazing, urban development, and windbreaks.

This unit is well suited to irrigated crops and pasture. Furrow, border, corrugation, and sprinkler irrigation systems are suited to the unit. Drip irrigation is suited to orchards. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. The risk of flooding can be reduced by the use of levees, dikes, and diversions. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage. Timely harvesting improves the quality of crops.

The potential plant community on this unit is mainly giant sacaton, western wheatgrass, vine-mesquite, and alkali sacaton. As the plant community deteriorates, the more desirable forage plants decrease and tobosa, threeawn, burrograss, and fluffgrass, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 4,000 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitation is the hazard of rare periods of flooding. Flooding can be controlled only by use of major flood control structures. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is well suited to windbreaks and environmental plantings. The hazard of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are Arizona cypress and green ash. Among the shrubs are American plum and desertwillow.

34—Manzano-Ruidoso association, 0 to 5 percent slopes. This map unit is in upland valleys and on alluvial fans and terraces. Areas are elongated in shape and are 400 to 3,000 acres in size. The native vegetation is mainly grasses. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 60 percent Manzano loam, 0 to 5 percent slopes, and 25 percent Ruidoso clay loam, 3 to 5 percent slopes. The Manzano soil is in upland valleys and on alluvial fans, and the Ruidoso soil is on terraces and alluvial fans.

Included in this unit are small areas of Lonti soils on toe slopes of hills and Haverson, Ellicott, and Paymaster soils in valleys and on flood plains. Included areas make up about 15 percent of the total acreage.

The Manzano soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown loam about 20 inches thick. The subsoil is dark brown clay loam about 8 inches thick. The substratum to a depth of 60 inches or more is dark brown clay loam.

Permeability of the Manzano soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Ruidoso soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown clay loam about 10 inches thick. The subsoil is dark brown clay about 40 inches thick. The substratum to a depth of 60 inches or more is dark brown sandy clay.

Permeability of the Ruidoso soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on the Manzano soil is mainly sideoats grama, blue grama, black grama, New Mexico feathergrass, and bottlebrush squirreltail. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

The potential plant community on the Ruidoso soil is mainly blue grama, sideoats grama, tobosa, and black grama. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, broom snakeweed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 875 pounds per acre in favorable years to 300 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

35—Mimbres-Arizo-Riverwash association, 0 to 5 percent slopes. This map unit is on flood plains and alluvial fans and in drainage channels. Areas are elongated in shape and are 50 to 1,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 40 percent Mimbres loam, 0 to 1 percent slopes; 30 percent Arizo loamy sand, 0 to 5 percent slopes; and 15 percent Riverwash. The Mimbres soil is on flood plains, the Arizo soil is on alluvial fans, and Riverwash is in drainage channels.

Included in this unit are small areas of Mohave soils on alluvial fans, Stellar soils on alluvial fans and plains, Verhalen soils on flood plains, and Hondale soils on alluvial flats and in bolsons. Included areas make up about 15 percent of the total acreage.

The Mimbres soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown loam about 6 inches thick. The subsoil is reddish brown silty clay loam about 16 inches thick. The substratum to a depth of 60 inches or more is reddish brown silty clay loam.

Permeability of the Mimbres soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to frequent, very brief periods of flooding in July through September.

The Arizo soil is deep and excessively drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown and grayish brown loamy sand about 12 inches thick. The upper 6 inches of the substratum is brown loamy fine sand, and the lower part to a depth of 60 inches or more is grayish brown very gravelly sand.

Permeability of the Arizo soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high. This soil is subject to frequent, very brief periods of flooding in March through September.

Riverwash consists of sand, silt, and gravel that are periodically reworked by water.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly giant sacaton, alkali sacaton, tobosa, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants decrease and burrograss, threeawn, feather fingergrass, and mat muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 3,000 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are the hazard of soil blowing and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

36—Muzzler very cobbly clay loam, 15 to 35 percent slopes. This shallow and well drained soil is on hills. It formed in residuum derived dominantly from acid igneous rock. Areas are elongated in shape and are 200 to 1,000 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,000 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is dark grayish brown very cobbly clay loam about 3 inches thick. The subsoil is very dark grayish brown very cobbly clay about 9 inches thick. Acid igneous rock is at a depth of 12 inches.

Included in this unit are small areas of Manzano soils in valleys, Ruidoso soils on terraces, and Luzena and Abrazo soils on hills and ridges. Included areas make up about 15 percent of the total acreage.

Permeability of this Muzzler soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, and plains lovegrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are slope, clayey texture, rock fragments, and depth to rock.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

37—Muzzler-Rock outcrop association, 25 to 45 percent slopes. This map unit is on hills, mountains, ledges, ridges, and escarpments. Areas are oval in shape and are 200 to 2,000 acres in size. The native vegetation is mainly grasses, shrubs, and forbs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 60 percent Muzzler cobbly sandy loam, 25 to 45 percent slopes, and 25 percent Rock outcrop. The Muzzler soil is on hills and mountains, and Rock outcrop is on ledges, ridges, and escarpments.

Included in this unit are small areas of Ruidoso soils on alluvial fans and terraces, Orthents on eroded hillsides, and Oro Grande and Luzena soils on hills. Included areas make up about 15 percent of the total acreage.

The Muzzler soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite and andesite. Typically, the surface layer is dark grayish brown cobbly sandy loam about 2 inches thick. The subsoil is very dark grayish brown and dark brown very cobbly clay about 17 inches thick. Rhyolite is at a depth of 19 inches.

Permeability of the Muzzler soil is slow. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

Rock outcrop consists of barren or nearly barren bedrock.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, and plains lovegrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. Although this is mainly a grassland unit, juniper and shrubs are dominant in an area east of Santa Rita. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, rock fragments, and slope.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

38—Nickel-Upton association, 2 to 15 percent slopes. This map unit is on alluvial fans, foot slopes, and side slopes. Areas are oval in shape and are 50 to 2,000 acres in size. The native vegetation is mainly shrubs, forbs, and grasses. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 50 percent Nickel gravelly sandy loam, 2 to 15 percent slopes, and 40 percent Upton gravelly loam, 2 to 5 percent slopes. The Nickel soil is on alluvial fans and side slopes, and the Upton soil is on foot slopes and alluvial fans.

Included in this unit are small areas of Tres Hermanos soils on piedmonts, Mohave and Stellar soils on alluvial fans and basin floors, Mimbres soils on plains, and a soil that is similar to this Nickel soil but is 25 to 35 percent gravel. Included areas make up about 10 percent of the total acreage.

The Nickel soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown gravelly sandy loam about 6 inches thick. The subsoil is brown gravelly sandy loam

and very gravelly sandy loam about 13 inches thick. The substratum to a depth of 60 inches or more is light brown very gravelly silt loam and very gravelly loamy sand.

Permeability of the Nickel soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Upton soil is shallow and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown gravelly loam about 3 inches thick. The subsoil is brown gravelly clay loam about 10 inches thick. Indurated caliche is at a depth of 13 inches.

Permeability of the Upton soil is moderate. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly bush muhly, black grama, creosotebush, and plains bristlegrass. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, sand dropseed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 500 pounds per acre in favorable years to 125 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are rock fragments, high lime content, the hazard of water erosion, and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

39—Oro Grande-Rock outcrop complex, 5 to 15 percent slopes. This map unit is on hills and mountains. Areas are irregular in shape and are 10 to 400 acres in size. The native vegetation is mainly juniper, pinyon, and grasses. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 65 percent Oro Grande very cobbly loam, 5 to 15 percent slopes, and 20 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Oro Grande soils that have slopes of more than 15 percent and Encierro, Luzena, Muzzler, and Abrazo soils on hills. Included areas make up about 15 percent of the total acreage.

The Oro Grande soil is shallow and well drained. It formed in residuum derived dominantly from dolomitic limestone. Typically, the surface layer is dark grayish brown very cobbly loam about 9 inches thick. The substratum is dark brown very cobbly loam about 4 inches thick. Dolomitic limestone is at a depth of 13 inches.

Permeability of the Oro Grande soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop consists of barren or nearly barren bedrock.

This unit is used for livestock grazing and as woodland.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, plains lovegrass, juniper, and pinyon. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are the areas of Rock outcrop and depth to rock of the Oro Grande soil.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is moderately well suited to pinyon and juniper production. It supports stands with a basal area of about 50 square feet per acre. The potential for firewood production is good, and the potential for Christmas trees, pinyon nuts, mine supports, and fenceposts is fair. To prevent deterioration of the woodland, the stands of pinyon and juniper on this unit can be managed for a combination of uses, including firewood production.

40—Oro Grande-Rock outcrop complex, 25 to 75 percent slopes. This map unit is on hills and mountains. Areas are irregular in shape and are 10 to 600 acres in size. The native vegetation is mainly juniper, pinyon, and grasses. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average

annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 40 percent Oro Grande very cobbly loam, 25 to 75 percent slopes, and 30 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Encierro, Luzena, Muzzler, and Abrazo soils on hills, Santa Fe soils on hills and mountains, and Manzano soils in valleys. Included areas make up about 30 percent of the total acreage.

The Oro Grande soil is shallow and well drained. It formed in residuum derived dominantly from dolomitic limestone. Typically, the surface layer is dark grayish brown very cobbly loam about 8 inches thick. The substratum is dark brown very cobbly loam about 4 inches thick. Dolomitic limestone is at a depth of 12 inches.

Permeability of the Oro Grande soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop consists of barren or nearly barren bedrock.

This unit is used for livestock grazing and as woodland.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, plains lovegrass, juniper, and pinyon. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are areas of Rock outcrop, depth to rock of the Oro Grande soil, and slope.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to pinyon and juniper production. It supports stands with a basal area of about 15 square feet per acre. The potential for fenceposts and mine supports is good, and the potential for firewood, Christmas trees, and pinyon nuts is poor. To prevent deterioration of the woodland, the stands of pinyon and juniper on this unit can be managed for a combination of uses, including firewood production.

41—Orthents, 25 to 60 percent slopes. These shallow to deep and well drained soils are on eroded breaks and ridges. They formed in alluvium derived from mixed sources. Areas are irregular in shape and are 300 to 2,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 7,000 feet. The average annual precipitation is 8 to 16 inches, the average annual air temperature is 48 to 62 degrees F, and the average frost-free period is 150 to 220 days.

Orthents are variable in their characteristics. No single profile is typical of these soils.

Included in this unit are small areas of Manzano soils in upland valleys; Lonti, Guy, Jonale, and Lehmans soils and Lithic Haplargids on hills; and Ruidoso soils on alluvial fans. Included areas make up about 15 percent of the total acreage.

Permeability of the Orthents is moderately slow to rapid. Available water capacity is very low to high. Effective rooting depth is 10 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate to high.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, New Mexico feathergrass, oak, and threeawn. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, tridens, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 225 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are slope and depth to rock in some areas.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

42—Paymaster gravelly sandy loam, 3 to 15 percent slopes. This deep and well drained soil is on foot slopes and alluvial fans. It formed in alluvium derived from mixed sources. Areas are irregular in shape and are 5 to 150 acres in size. The native vegetation is mainly grasses. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is very dark grayish brown gravelly sandy loam about 10 inches thick. The substratum to a depth of 60 inches or more is very dark grayish brown and very dark gray sandy loam.

Included in this unit are small areas of Ellicott and Manzano soils on alluvial fans and side slopes, Ruidoso soils on fans and terraces, and Lonti and Guy soils on hills. Included areas make up about 15 percent of the total acreage.

Permeability of this Paymaster soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly black grama, blue grama, New Mexico feathergrass, and sideoats grama. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, ring muhly, and sand dropseed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

43—Paymaster-Ellicott complex, 0 to 1 percent slopes. This map unit is on flood plains and alluvial fans. Areas are irregular in shape and are 2 to 200 acres in size. The native vegetation is mainly grasses. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 60 percent Paymaster sandy loam and 20 percent Ellicott gravelly sand. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Riverwash along stream channels, Manzano soils on flood plains, Paymaster and Ellicott soils that have slopes of 1 to 3 percent, and soils that are similar to the Paymaster and Ellicott soils but are wet. Included areas make up about 20 percent of the total acreage.

The Paymaster soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark grayish brown sandy loam about 14 inches thick. The substratum to a depth of 60 inches or more is grayish brown and dark grayish brown sandy loam and loam.

Permeability of the Paymaster soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare, very brief periods of flooding in July through September.

The Ellicott soil is deep and somewhat excessively drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown gravelly sand about 8 inches thick. The substratum to a depth of 60 inches or more is grayish brown sand and loamy sand with thin strata of finer textured material.

Permeability of the Ellicott soil is rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high. This soil is subject to frequent, brief periods of flooding from July through September.

Most areas of this unit are used for irrigated crops and pasture. A few areas are used for livestock grazing, urban development, and windbreaks.

If this unit is used for irrigated crops and pasture, the main limitations are droughtiness, moderately rapid and rapid permeability, and the hazards of soil blowing and flooding. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Drip irrigation is suited to orchards.

Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. The risk of flooding can be reduced by the use of levees, dikes, and diversions. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage.

The potential plant community on this unit is mainly giant sacaton, western wheatgrass, vine-mesquite, and alkali sacaton. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, threeawn, burrograss, and tobosa, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 4,000 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact

between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are the hazards of soil blowing and flooding and the sandy texture of the soils. Flooding can be controlled only by use of major flood control structures. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems.

This unit is moderately well suited to windbreaks and environmental plantings. The main limitations are droughtiness, moderately rapid and rapid permeability, and the hazard of soil blowing. Soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are Lombardy poplar, ponderosa pine, and Arizona cypress. Among the shrubs are smooth lilac, squawbush, and common lilac.

44—Paymaster-Ellicott complex, 1 to 3 percent slopes. This map unit is on flood plains and alluvial fans. Areas are irregular in shape and are 2 to 200 acres in size. The native vegetation is mainly grasses. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 40 percent Paymaster fine sandy loam and 25 percent Ellicott gravelly sand. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Manzano soils on alluvial fans, Riverwash in stream channels, Paymaster and Ellicott soils that have slopes of less than 1 percent, and soils that are similar to the Paymaster and Ellicott soils but are wet. Included areas make up about 35 percent of the total acreage.

The Paymaster soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown fine sandy loam about 10 inches thick. The substratum, to a depth of 35 inches, is dark grayish brown very fine sandy loam and fine sandy loam. Below this to a depth of 60 inches or more is dark brown extremely gravelly loamy sand.

Permeability of the Paymaster soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare, very brief periods of flooding from July through September.

The Ellicott soil is deep and somewhat excessively drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark yellowish brown gravelly sand about 6 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown sand with strata of gravelly sand.

Permeability of the Ellicott soil is rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is very high. This soil is subject to frequent, brief periods of flooding from July through September.

Most areas of this unit are used for irrigated crops and pasture. A few areas are used for livestock grazing, urban development, and windbreaks.

If this unit is used for irrigated crops and pasture, the main limitations are droughtiness, moderately rapid and rapid permeability, and the hazard of soil blowing. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Drip irrigation is suited to orchards. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage.

The potential plant community on this unit is mainly giant sacaton, western wheatgrass, alkali sacaton, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, threeawn, burrograss, and tobosa, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 4,000 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are the hazard of flooding, sandy texture, and the hazard of soil blowing. Flooding can be controlled only by use of major flood control structures. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems.

This unit is moderately well suited to windbreaks and environmental plantings. The main limitations are

droughtiness, moderately rapid and rapid permeability, and the hazard of soil blowing. Soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are Arizona sycamore, green ash, and Lombardy poplar. Among the shrubs are common lilac, desertwillow, and smooth sumac.

45—Paymaster-Ellicott-Manzano association, 0 to 5 percent slopes. This map unit is on flood plains and alluvial fans and in old stream channels and valleys. Areas are elongated in shape and are 50 to 1,000 acres in size. The native vegetation is mainly grasses. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 40 percent Paymaster fine sandy loam, 2 to 5 percent slopes; 30 percent Ellicott gravelly sand, 1 to 3 percent slopes; and 20 percent Manzano loam, 0 to 3 percent slopes. The Paymaster soil is on alluvial fans and flood plains, the Ellicott soil is in old stream channels, and the Manzano soil is on flood plains and alluvial fans and in valleys.

Included in this unit are small areas of Riverwash in stream channels, Haverson soils on flood plains, and Ruidoso soils on alluvial fans and terraces. Included areas make up about 10 percent of the total acreage.

The Paymaster soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is very dark grayish brown fine sandy loam about 5 inches thick. The substratum to a depth of 60 inches or more is dark grayish brown fine sandy loam.

Permeability of the Paymaster soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare, very brief periods of flooding in July through September.

The Ellicott soil is deep and somewhat excessively drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark yellowish brown gravelly sand about 6 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown loamy sand and sand with thin strata of gravelly sand.

Permeability of the Ellicott soil is rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to frequent, brief periods of flooding in July through September.

The Manzano soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown loam about 3 inches thick. The subsoil is brown clay loam about 23 inches thick. The substratum to a depth of 60 inches or more is brown clay loam.

Permeability of the Manzano soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to rare, very brief periods of flooding in July through September.

This unit is used for livestock grazing.

The potential plant community on the Paymaster and Manzano soils is mainly sideoats grama, blue grama, black grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

The potential plant community on the Ellicott soil is mainly black grama, sideoats grama, hairy grama, and blue grama. As the plant community deteriorates, the more desirable forage plants decrease and sand dropseed, threeawn, and fluffgrass, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 850 pounds per acre in favorable years to 300 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, water development, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

46—Pits-Dumps association, extremely steep. This map unit is on hills and flats. Areas are irregular in shape and are 5 to 2,000 acres in size. These areas are essentially barren of vegetation. Slopes range from 3 to more than 75 percent. Elevation is 4,000 to 7,200 feet. The average annual precipitation is 8 to 16 inches, the average annual air temperature is 48 to 62 degrees F, and the average frost-free period is 150 to 220 days.

This unit is 45 percent Pits and 45 percent Dumps.

Included in this unit are small areas of Santa Fe, Santana, Muzzler, Lehmans, Plack, Upton, and Lonti soils and Lithic Haplargids. Included areas make up about 10 percent of the total acreage.

Pits are open excavations from which soil and underlying material have been removed, exposing rock or other material that supports little if any plant life.

Dumps are accumulations of waste rock, mine spoil, and other refuse that supports little if any plant life. Mine spoil initially is very strongly alkaline; however, after 3 or 4 years, as a result of rapid oxidation of sulfides, the reaction of the surface layer becomes extremely acid.

This unit has limited value for agricultural uses. The main limitations are low precipitation, lack of organic matter, rock fragments, and extreme acidity or alkalinity. The value of this unit as construction material depends, to a large extent, on the texture of the material.

47—Plack gravelly loam, 0 to 8 percent slopes. This shallow and well drained soil is on broad terrace remnants. It formed in residuum derived dominantly from conglomerate. Areas are wide and elongated in shape and are 10 to 1,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,000 to 6,000 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is grayish brown gravelly loam about 2 inches thick. Below this to a depth of about 15 inches is grayish brown and light brownish gray loam. Indurated caliche is at a depth of 17 inches.

Included in this unit are small areas of Guy and Plack Variant soils on ridges, Manzano soils in valleys, and Lonti soils on hills. Included areas make up about 15 percent of the total acreage.

Permeability of this Plack soil is moderate. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly black grama, sideoats grama, New Mexico feathergrass, blue grama, and winterfat. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, ring muhly, fluffgrass, and sand muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,200 pounds per acre in favorable years to 400 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to the cemented pan and high lime content.

Range management practices such as deferred-rotation grazing, water development, and proper grazing use are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are slope and depth to indurated caliche.

48—Plack Variant-Guy complex, 1 to 8 percent slopes. This map unit is on ridges. Areas are irregular in shape and are 10 to 100 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 50 percent Plack Variant gravelly loam and 30 percent Guy gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Lonti, Boysag, and Santana soils on hills and Manzano soils in valleys. Included areas make up about 20 percent of the total acreage.

The Plack Variant soil is shallow and well drained. It formed in residuum derived dominantly from conglomerate. Typically, the surface layer is grayish brown gravelly loam about 5 inches thick. The substratum is light gray gravelly silt loam about 6 inches thick. Conglomerate is at a depth of 11 inches.

Permeability of the Plack Variant soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Guy soil is deep and well drained. It formed in old alluvium and eolian material derived dominantly from conglomerate. Typically, the surface layer is grayish brown and light brown gravelly loam about 10 inches thick. The substratum to a depth of 60 inches or more is stratified pinkish gray, light gray, and light brown gravelly loam, gravelly loamy sand, and gravelly sandy loam.

Permeability of the Guy soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, sand dropseed, hairy grama, and Hall panicum, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,100 pounds per acre in favorable years to 375 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock of the Plack Variant soil and high lime content.

Range management practices such as deferred-rotation grazing, proper range use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are depth to bedrock of the Plack Variant soil, high lime content, and slope. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

49—Plack Variant-Guy complex, 15 to 35 percent slopes. This map unit is on ridges. Areas are irregular in shape and are 10 to 100 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 50 percent Plack Variant gravelly loam and 30 percent Guy very cobbly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Boysag, Santana, and Lonti soils on ridges and Manzano soils in valleys. Included areas make up about 20 percent of the total acreage.

The Plack Variant soil is shallow and well drained. It formed in residuum derived dominantly from conglomerate. Typically, the surface layer is very dark grayish brown gravelly loam about 5 inches thick. The substratum is brown gravelly silt loam about 5 inches thick. Conglomerate is at a depth of 10 inches.

Permeability of the Plack Variant soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Guy soil is deep and well drained. It formed in old alluvium and eolian material derived from conglomerate. Typically, the surface layer is dark grayish brown very cobbly loam about 8 inches thick. The substratum to a depth of 60 inches or more is light brownish gray and light gray gravelly loam, gravelly sandy loam, and gravelly loamy sand.

Permeability of the Guy soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, sand dropseed, hairy grama, and Hall panicum, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,100 pounds per acre in favorable years to 375 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to bedrock of the Plack Variant soil and high lime content.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to urban development. The main limitations are depth to bedrock of the Plack Variant soil, high lime content, and slope. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

50—Riverwash. This map unit is in intermittent stream channels. Slope is 0 to 3 percent. Areas are long and narrow in shape and are 3 to 150 acres in size. This unit supports little if any vegetation. Elevation is 4,000 to 7,000 feet. The average annual precipitation is 8 to 16 inches, the average annual air temperature is 48 to 62 degrees F, and the average frost-free period is 150 to 220 days.

Riverwash consists of sand, silt, and gravel that are periodically reworked by water.

Included soils in this unit vary depending on the soils adjacent to the intermittent streams. Included areas make up about 15 percent of the total acreage.

This unit is used as a source of sand and gravel. It has limited value for agricultural uses.

51—Rock outcrop-Graham association, 5 to 25 percent slopes. This map unit is on hills, ledges, benches, and ridges. Areas are irregular in shape and are 50 to 2,000 acres in size. The native vegetation is mainly grasses, forbs, and shrubs. Elevation is 4,500 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 50 percent Rock outcrop and 30 percent Graham clay loam, 5 to 25 percent slopes. Rock outcrop is on ledges, ridges, hills, and benches, and the Graham soil is on hills.

Included in this unit are small areas of Riverwash along stream channels, Lehmans soils on hills, and Tres Hermanos soils on alluvial fans. Included areas make up about 20 percent of the total acreage.

Rock outcrop consists of barren or nearly barren bedrock.

The Graham soil is shallow and well drained. It formed in residuum derived dominantly from igneous rock. Typically, the surface layer is brown clay loam about 1 inch thick. The subsoil is dark reddish gray and reddish brown clay about 12 inches thick. Andesite is at a depth of 13 inches.

Permeability of the Graham soil is slow. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly black grama, bush muhly, blue grama, and sideoats grama. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, tobosa, Hall panicum, and tridens, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 750 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to bedrock and the areas of Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and trails are suited to this unit. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

52—Rock outcrop-Lithic Ustorthents complex, 15 to 65 percent slopes. This map unit is on hills and mountains. Areas are irregular in shape and are 800 to 6,000 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 50 percent Rock outcrop and 30 percent Lithic Ustorthents, 15 to 65 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Santana, Santa Fe, Muzzler, and Luzena soils on hills and Manzano soils in valleys. Included areas make up about 20 percent of the total acreage.

Rock outcrop consists of barren or nearly barren bedrock.

Lithic Ustorthents are shallow and well drained. They formed in colluvium and residuum derived dominantly from acid igneous rock. Lithic Ustorthents are variable in their characteristics. No single profile is typical of these soils.

Permeability of the Lithic Ustorthents is moderately slow to moderately rapid. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, New Mexico feathergrass, and juniper. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, slope, and the areas of Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and trails are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

53—Rock outcrop-Luzena association, 25 to 60 percent slopes. This map unit is on hills, ridges, ledges, cliffs, and escarpments. Slope is 25 to 60 percent. Areas are irregular in shape and are 300 to 2,500 acres in size. The native vegetation is mainly grasses, forbs, and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 50 percent Rock outcrop and 30 percent Luzena gravelly clay loam, 25 to 60 percent slopes. Rock outcrop is on ridges, ledges, cliffs, and escarpments, and the Luzena soil is on hills.

Included in this unit are small areas of Manzano soils in valleys, Muzzler and Abrazo soils and Lithic Ustorthents on hills, and Santana soils on hills and ridges. Included areas make up about 20 percent of the total acreage.

Rock outcrop consists of barren or nearly barren bedrock.

The Luzena soil is shallow and well drained. It formed in residuum derived dominantly from andesite and rhyolite. Typically, the surface layer is brown gravelly clay loam about 3 inches thick. The subsoil is brown gravelly clay loam and clay about 7 inches thick. Andesite is at a depth of 10 inches.

Permeability of the Luzena soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, New Mexico feathergrass, and juniper. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, slope, and the areas of Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and trails are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

54—Rock outcrop-Muzzler association, 25 to 65 percent slopes. This map unit is on hills, mountains, ledges, and ridges. Areas are irregular in shape and are 200 to 2,000 acres in size. The native vegetation is mainly grasses, forbs, and shrubs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 65 percent Rock outcrop and 25 percent Muzzler cobbly loam, 25 to 65 percent slopes. Rock outcrop is on ledges and ridges, and the Muzzler soil is on hills and mountains.

Included in this unit are small areas of Santana and Luzena soils and Lithic Ustorthents on hills and mountains and Manzano soils in valleys. Included areas make up about 10 percent of the total acreage.

Rock outcrop consists of barren or nearly barren bedrock.

The Muzzler soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite and other acid igneous rock. Typically, the surface layer is dark brown cobbly loam about 5 inches thick. The subsoil is dark brown very cobbly clay loam about 8 inches thick. Acid igneous rock is at a depth of 13 inches.

Permeability of the Muzzler soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, black grama, blue grama, New Mexico feathergrass, and juniper. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock, slope, and areas of Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and trails are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

55—Ruidoso clay loam, 3 to 5 percent slopes. This deep and well drained soil is on terraces and alluvial fans and in valleys. It formed in alluvium derived from mixed sources. Areas are oblong in shape and are 4 to 200 acres in size. The native vegetation is mainly grasses. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is dark brown clay loam about 3 inches thick. The subsoil is dark grayish brown and brown clay about 57 inches thick.

Included in this unit are small areas of Lonti soils on toe slopes of hills and Manzano soils in valleys. Included areas make up about 15 percent of the total acreage.

Permeability of the Ruidoso soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Most areas of this unit are used for irrigated crops and pasture. A few areas are used for livestock grazing, urban development, and windbreaks.

If this unit is used for irrigated crops and pasture, the main limitations are clayey texture and slow permeability.

Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage.

The potential plant community on this unit is mainly blue grama, sideoats grama, black grama, and tobosa. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, broom snakeweed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 875 pounds per acre in favorable years to 300 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is moderately well suited to urban development. The main limitations are shrink-swell potential and restricted load supporting capacity. If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is moderately well suited to windbreaks and environmental plantings. The main limitations are slow permeability and low precipitation. Soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are Arizona sycamore and Arizona cypress. Among the shrubs are autumn-olive and American plum.

56—Ruidoso-Muzzler association, 5 to 15 percent slopes. This map unit is on hills and in valleys. Areas are oblong in shape and are 50 to 3,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 45 percent Ruidoso clay loam, 5 to 8 percent slopes, and 35 percent Muzzler cobbly loam, 5 to 15 percent slopes. The Ruidoso soil is in valleys, and the Muzzler soil is on hills.

Included in this unit are small areas of Rock outcrop on hills and ridges, Abrazo soils on hills, Manzano soils in valleys, and Luzena soils on hills. Included areas make up about 20 percent of the total acreage.

The Ruidoso soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown clay loam about 3 inches thick. The next layer is dark brown clay loam about 8 inches thick. Below this to a depth of 60 inches or more is very dark grayish brown clay.

Permeability of the Ruidoso soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Muzzler soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, the surface layer is very dark grayish brown cobbly loam about 2 inches thick. The subsoil is very dark gray very cobbly clay about 6 inches thick. Rhyolite is at a depth of 8 inches.

Permeability of the Muzzler soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on the Ruidoso soil is mainly blue grama, sideoats grama, black grama, and tobosa. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, broom snakeweed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 875 pounds per acre in favorable years to 300 pounds in unfavorable years.

The potential plant community on the Muzzler soil is mainly sideoats grama, black grama, blue grama, New Mexico feathergrass, and juniper. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, fencing, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during

successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

57—Sampson-Dagflat complex, 3 to 12 percent slopes. This map unit is on the bottoms and sides of intraridge valleys. Areas are irregular in shape and are 5 to 200 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 50 percent Sampson loamy sand, 3 to 9 percent slopes, and 30 percent Dagflat loam, 3 to 12 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Manzano soils in valleys, Santana and Santa Fe soils on hills, and Carnero soils in valleys. Included areas make up about 20 percent of the total acreage.

The Sampson soil is deep and well drained. It formed in alluvium derived dominantly from igneous rock. Typically, the upper part of the surface layer is brown loamy sand about 1 inch thick, and the lower part is dark grayish brown sandy clay loam about 2 inches thick. The subsoil is dark grayish brown and grayish brown sandy clay loam about 42 inches thick. The substratum to a depth of 60 inches or more is brown and light brown sandy clay loam.

Permeability of the Sampson soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is very high.

The Dagflat soil is moderately deep and well drained. It formed in residuum derived dominantly from igneous rock. Typically, the surface layer is brown loam about 8 inches thick. The subsoil is brown and dark reddish gray sandy clay loam and gravelly sandy clay loam about 23 inches thick. Igneous rock is at a depth of 31 inches.

Permeability of the Dagflat soil is moderate. Available water capacity is moderate. Effective rooting depth is 21 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is moderately well suited to urban development. The main limitations are slope, depth to rock, and restricted load supporting capacity. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

58—Sanloren-Majada Variant complex, 1 to 15 percent slopes. This map unit is on terrace remnants and ridges. Areas are oval in shape and are 2 to 300 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Sanloren loam, 1 to 10 percent slopes, and 30 percent Majada Variant cobbly loam, 1 to 15 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Manzano soils along drainageways, Tesajo soils on old terraces, and Ruidoso soils on terraces. Included areas make up about 15 percent of the total acreage.

The Sanloren soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown loam about 10 inches thick. The upper 10 inches of the subsoil is brown clay loam, and the lower 17 inches is brown very cobbly clay. The substratum to a depth of 60 inches or more is brown very cobbly sandy clay loam.

Permeability of the Sanloren soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Majada Variant soil is deep and well drained. It formed in alluvium derived dominantly from mixed sources. Typically, the surface layer is brown cobbly loam about 11 inches thick. The subsoil to a depth of 60 inches or more is brown very cobbly loam.

Permeability of the Majada Variant soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The smoother, less sloping areas of this unit are used for irrigated crops and pasture. Many areas are used for livestock grazing.

This unit is better suited to pasture than to cultivated crops. If the unit is used for irrigated crops and pasture, the main limitations are slope, coarse fragments on the surface, and the content of gravel and cobbles. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, water development, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

59—Santa Fe-Rock outcrop complex, 5 to 15 percent slopes. This map unit is on hills and ridges. Areas are irregular in shape and are 10 to 300 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Santa Fe gravelly sandy loam, 5 to 15 percent slopes, and 20 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Santa Fe soils that have slopes of more than 15 percent and Carnero and Dagflat soils in intraridge valleys and on side slopes. Included areas make up about 25 percent of the total acreage.

The Santa Fe soil is shallow and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is dark brown gravelly sandy loam about 2 inches thick. The subsoil is dark brown very gravelly clay loam about 16 inches thick. Acid igneous rock is at a depth of 18 inches.

Permeability of the Santa Fe soil is moderate. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

Rock outcrop consists of barren or nearly barren exposures of bedrock.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly black grama, New Mexico feathergrass, sideoats grama, and blue grama. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, ring muhly, and sand dropseed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock and Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are slope, depth to bedrock, and Rock outcrop. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

60—Santa Fe-Rock outcrop complex, 20 to 45 percent slopes. This map unit is on hills, mountains, and ridges. Areas are irregular in shape and are 20 to 3,000 acres in size. The native vegetation is mainly pinyon, juniper, and grasses. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Santa Fe gravelly sandy loam, 20 to 45 percent slopes, and 25 percent Rock outcrop.

The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Santa Fe soils that have slopes of less than 20 percent, Manzano soils in upland valleys, Gaddes soils on ridges, and Luzena, Abrazo, and Santana soils on hills. Included areas make up about 20 percent of the total acreage.

The Santa Fe soil is shallow and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is dark brown gravelly sandy loam about 2 inches thick. The subsoil is dark brown very gravelly loam and very gravelly clay loam about 14 inches thick. Acid igneous rock is at a depth of 16 inches.

Permeability of the Santa Fe soil is moderate. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

Rock outcrop consists of barren or nearly barren exposures of bedrock.

This unit is used for livestock grazing and urban development and as woodland.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, plains lovegrass, and shrub live oak. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are slope, depth to bedrock, and Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to urban development. The main limitations are slope, depth to bedrock, and Rock outcrop. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is well suited to pinyon and juniper production. It supports stands with a basal area of about 40 square feet per acre. The potential for firewood, mine supports, and fenceposts is good, and the potential for pinyon nuts and Christmas trees is excellent. To prevent deterioration of the woodland, the stands of pinyon and juniper on this unit should be managed for a combination of uses, including firewood production.

61—Santa Fe, dry-Rock outcrop complex, 25 to 70 percent slopes. This map unit is on hills, mountains, and ridges. Areas are irregular in shape and are 200 to 4,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Santa Fe gravelly sandy loam, 25 to 70 percent slopes, and 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Manzano soils in upland valleys; Gaddes soils on ridges; Lonti, Luzena, Muzzler, and Santana soils on hills; and Lithic Ustorthents on hills and mountains. Included areas make up about 20 percent of the total acreage.

The Santa Fe soil is shallow and well drained. It formed in residuum derived dominantly from acid igneous rock. Typically, the surface layer is very dark grayish brown gravelly sandy loam about 4 inches thick. The subsoil is very dark grayish brown very gravelly loam about 10 inches thick. Acid igneous rock is at a depth of 14 inches.

Permeability of the Santa Fe soil is moderate. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Rock outcrop consists of barren or nearly barren exposures of bedrock.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are slope, depth to rock, and Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

62—Santana loamy sand, 15 to 25 percent slopes. This shallow, well drained soil is on hills. It formed in residuum derived dominantly from granite. Areas are oval in shape and are 100 to 800 acres in size. The native vegetation is mainly ponderosa pine and pinyon. Elevation is 6,000 to 7,000 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 150 to 170 days.

Typically, the surface layer is dark grayish brown loamy sand about 6 inches thick. The substratum is grayish brown loam about 7 inches thick. Granite is at a depth of about 13 inches.

Included in this unit are small areas of Santana soils that have slopes of less than 15 percent, Santa Fe and Gaddes soils on hills and ridges, and Rock outcrop on ledges, escarpments, and ridges. Included areas make up about 15 percent of the total acreage.

Permeability of the Santana soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 16 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is very high.

This unit is used for urban development and as woodland.

This unit is poorly suited to urban development. The main limitations are slope, depth to bedrock, and sandy texture. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This unit is moderately well suited to ponderosa pine production. It can produce 710 to 1,650 cubic feet, or 3,500 to 7,000 board feet (Scribner rule), of merchantable timber per acre from an even-aged, fully stocked stand of trees 80 years old. The site index for this unit ranges from 60 to 70. The main concern in producing and harvesting timber is the hazard of water erosion. Trees are subject to windthrow because of the limited rooting depth.

63—Santana-Rock outcrop complex, 1 to 25 percent slopes. This map unit is on hills and ridges. Areas are irregular in shape and are 10 to 800 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 45 percent Santana loam, 1 to 25 percent slopes, and 40 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Boysag, Lonti, and Muzzler soils on hills; Santana soils, near the "Kneeling Nun" area, that have slopes of more than 25 percent; and Santa Fe soils on hills and mountains. Included areas make up about 15 percent of the total acreage.

The Santana soil is shallow and well drained. It formed in residuum derived dominantly from granite. Typically, the surface layer is dark grayish brown loam about 8 inches thick. The substratum is dark grayish brown gravelly loam about 4 inches thick. Granite is at a depth of about 12 inches.

Permeability of the Santana soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 16 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Rock outcrop consists of barren or nearly barren exposures of bedrock.

This unit is used for livestock grazing and urban development.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, New Mexico feathergrass, and shrub live oak. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to bedrock and areas of Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

This unit is poorly suited to urban development. The main limitations are slope, depth to bedrock, and Rock outcrop. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

64—Santana-Rock outcrop complex, 15 to 35 percent slopes. This map unit is on hills and ridges. Areas are irregular in shape and are 200 to 2,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 60 percent Santana sandy loam, 15 to 35 percent slopes, and 20 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of moderately deep soils, on toe slopes, that are similar to the Santana soil; Manzano soils along drainageways; Lithic Ustorthents on hills and mountains; and Boysag, Santa Fe, and Lonti soils on hills. Included areas make up about 20 percent of the total acreage.

The Santana soil is shallow and well drained. It formed in residuum derived dominantly from granite and other acid igneous rock. Typically, the surface layer is dark brown sandy loam about 4 inches thick. The substratum is dark brown loam about 10 inches thick. Acid igneous rock is at a depth of about 14 inches.

Permeability of the Santana soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 16 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Rock outcrop consists of barren or nearly barren exposures of bedrock.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly sideoats grama, blue grama, black grama, shrub live oak, and New Mexico feathergrass. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, bullgrass, hairy grama, and broom snakeweed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to rock and areas of Rock outcrop.

Range management practices such as deferred-rotation grazing, proper grazing use, and trails are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. It is important that the stocking rate be adjusted for the most efficient use of the available forage, especially that on the steeper slopes.

65—Stellar-Mohave association, 0 to 5 percent slopes. This map unit is on alluvial plains and fans and in upland drainageways and depressional areas. Areas are irregular in shape and are 50 to 5,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 50 percent Stellar sandy clay loam, 0 to 2 percent slopes, and 35 percent Mohave sandy clay loam, 1 to 5 percent slopes. The Stellar soil is on alluvial plains and in drainageways and depressional areas, and the Mohave soil is on alluvial fans and plains.

Included in this unit are small areas of Bucklebar soils on plains and alluvial fans, Continental soils on plains and along drainageways, Sonoita soils on alluvial fans, and Mimbres soils along intermittent streams. Included areas make up about 15 percent of the total acreage.

The Stellar soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown sandy clay loam about 8 inches thick. The subsoil is reddish brown clay and clay loam about 27 inches thick. The substratum to a depth of 60 inches or more is pink gravelly clay loam.

Permeability of the Stellar soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Mohave soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is pale brown sandy clay loam about 3 inches thick. The subsoil is brown and light brown clay loam about 36 inches thick. The substratum to a depth of 60 inches or more is light brown sandy loam and sandy clay loam.

Permeability of the Mohave soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on the Stellar soil is mainly tobosa, black grama, alkali sacaton, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, burrograss, mat muhly, and mesquite, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 600 pounds per acre in favorable years to 200 pounds in unfavorable years.

The potential plant community on the Mohave soil is mainly black grama, bush muhly, tobosa, and sand dropseed. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, burrograss, ring muhly, and fluffgrass, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 675 pounds per acre in favorable years to 275 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are low precipitation and clayey texture.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

66—Stellar-Verhalen-Mimbres association, 0 to 2 percent slopes. This map unit is on alluvial plains and fans, on valley bottoms and basin floors, along intermittent streams, and in playas. Areas are elongated in shape and are 20 to 1,500 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 40 percent Stellar silty clay loam, 0 to 2 percent slopes; 20 percent Verhalen clay, 0 to 1 percent slopes; and 15 percent Mimbres silty clay loam, 0 to 1 percent slopes. The Stellar soil is on alluvial fans and plains, the Verhalen soil is on valley bottoms and basin floors, and the Mimbres soil is along intermittent streams and in playas.

Included in this unit are small areas of Mohave soils on alluvial fans, Hondale soils in playas, and Riverwash in stream channels. Included areas make up about 25 percent of the total acreage.

The Stellar soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is light brown silty clay loam about 6 inches thick. The subsoil is reddish brown clay about 20 inches thick. The substratum to a depth of 60 inches or more is light reddish brown clay loam.

Permeability of the Stellar soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Verhalen soil is deep and moderately well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is pinkish gray clay about 10 inches thick. The substratum to a depth of 60 inches or more is brown clay.

Permeability of the Verhalen soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare, very brief periods of flooding in July through September.

The Mimbres soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is brown silty clay loam about 6 inches thick. The subsoil is reddish brown silty clay loam about 17 inches thick. The substratum to a depth of 60 inches or more is reddish brown silty clay loam.

Permeability of the Mimbres soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to rare, very brief periods of flooding in July through September.

This unit is used for livestock grazing.

The potential plant community on the Stellar soil is mainly tobosa, black grama, alkali sacaton, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, burrograss, mat muhly, and mesquite, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 600 pounds in favorable years to 200 pounds in unfavorable years.

The potential plant community on the Verhalen and Mimbres soils is mainly tobosa, alkali sacaton, giant sacaton, and vine-mesquite. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, mat muhly, and mesquite, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 2,500 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are clayey texture, the hazard of soil blowing, and low precipitation.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

67—Stirk Variant silty clay loam, 0 to 1 percent slopes. This deep and moderately well drained soil is on flood plains and alluvial fans. It formed in alluvium derived from mixed sources. Areas are oblong in shape and are 3 to 150 acres in size. The native vegetation is mainly grasses. Elevation is 5,000 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is light brownish gray silty clay loam about 2 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silty clay and clay.

Included in this unit are small areas of Haverson, Manzano, Paymaster, and Ellicott soils on flood plains and soils that are similar to this Stirk Variant soil but have a water table at a depth of 2 to 4 feet. Included areas make up about 20 percent of the total acreage.

Permeability of this Stirk Variant soil is very slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare, very brief periods of flooding from July through September.

Most areas of this unit are used for irrigated pasture. In some areas other irrigated crops such as alfalfa and

barley are grown. Some areas are used for livestock grazing and windbreaks.

If this unit is used for irrigated crops and pasture, the main limitations are clayey soil texture and the hazards of flooding and soil blowing. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Maintaining crop residue on or near the surface reduces soil blowing and helps to maintain soil tilth and organic matter content. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage. Timely harvesting improves the quality of crops. The risk of flooding can be reduced by the use of dikes, levees, and diversions.

The potential plant community on this unit is mainly giant sacaton, western wheatgrass, vine-mesquite, and alkali sacaton. As the plant community deteriorates, the more desirable forage plants decrease and tobosa, threeawn, burrograss, and fluffgrass, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 4,000 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is moderately well suited to windbreaks and environmental plantings. The main limitations are the hazard of soil blowing and clayey texture. Soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are Lombardy poplar and Arizona sycamore. Among the shrubs are smooth sumac and autumn-olive.

68—Tesajo very gravelly loam, 8 to 15 percent slopes. This deep and well drained soil is on alluvial fans and foot slopes. It formed in alluvium derived from mixed sources. Areas are irregular in shape and are 5 to 300 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is brown very gravelly loam about 3 inches thick. The subsoil is brown very gravelly loam about 21 inches thick. The substratum to a depth of 60 inches or more is brown very gravelly loam.

Included in this unit are small areas of Santana, Santa Fe, and Guy soils on hills, Ruidoso and Manzano soils on alluvial fans and in valleys, and Paymaster soils on foot slopes. Included areas make up about 15 percent of the total acreage.

Permeability of this Tesajo soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Most areas of this unit are used for livestock grazing. A few areas are used for urban development.

The potential plant community on this unit is mainly black grama, New Mexico feathergrass, sideoats grama, and blue grama. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, ring muhly, and sand dropseed, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,300 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is poorly suited to urban development. The main limitations are slope and coarse fragments. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

69—Tesajo-Manzano complex, 1 to 3 percent slopes. This map unit is on flood plains and alluvial fans. Areas are oval in shape and are 10 to 100 acres in size. The native vegetation is mainly grasses. Elevation is 5,000 to 6,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 55 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 55 percent Tesajo gravelly sandy loam and 15 percent Manzano gravelly sandy clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Riverwash along streams, Paymaster and Ellicott soils on flood plains, and soils that are similar to the Manzano soil but are gravelly in the subsoil and substratum. Included areas make up about 30 percent of the total acreage.

The Tesajo soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown gravelly sandy loam about 9 inches thick. The substratum to a depth of 60 inches or more is dark brown very cobbly sandy clay loam.

Permeability of the Tesajo soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare, very brief periods of flooding in July through September.

The Manzano soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown gravelly sandy clay loam about 11 inches thick. The substratum to a depth of 60 inches or more is very dark grayish brown and brown loam and clay loam.

Permeability of the Manzano soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to rare, very brief periods of flooding in July through September.

This unit is used for irrigated crops and pasture and for livestock grazing and windbreaks.

If this unit is used for irrigated crops and pasture, the main limitations are the gravelly surface layer of the soils and the hazard of flooding. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Maintaining crop residue on or near the surface reduces soil blowing and helps to maintain soil tilth and organic matter content. Yields of crops can be maintained or increased by using fertilizer. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphate. Rotation grazing helps to maintain the quality and quantity of forage. Timely harvesting improves the quality of crops. The risk of flooding can be reduced by the use of dikes, levees, and diversions.

The potential plant community on this unit is mainly sideoats grama, blue grama, vine-mesquite, New Mexico feathergrass, and black grama. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, fluffgrass, sand dropseed, and ring muhly, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 1,000 pounds per acre in favorable years to 350 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

This unit is moderately well suited to windbreaks and environmental plantings. The main limitations are the hazard of soil blowing and the content of coarse fragments in the soils. Soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are suitable for planting are Rocky Mountain juniper and Russian-olive. Among the shrubs are squawbush and American plum.

70—Tres Hermanos gravelly sandy clay loam, 0 to 8 percent slopes. This deep and well drained soil is on alluvial fans and foot slopes. It formed in alluvium derived from mixed sources. Areas are irregular in shape and are 400 to 1,500 acres in size. The native vegetation is mainly grasses and shrubs. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

Typically, the surface layer is brown gravelly sandy clay loam about 4 inches thick. The subsoil is brown gravelly clay loam about 10 inches thick. The substratum to a depth of 60 inches or more is pinkish white gravelly sandy loam.

Included in this unit are small areas of eroded Tres Hermanos soils on foot slopes and ridges, Bucklebar and Continental soils on plains, and Nickel soils on side slopes. Included areas make up about 20 percent of the total acreage.

Permeability of the Tres Hermanos soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly bush muhly, black grama, Arizona cottontop, creosotebush, and plains bristlegrass. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, sand dropseed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 500 pounds per acre in favorable years to 125 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are low precipitation and high lime content.

Range management practices such as deferred-rotation grazing, proper grazing use, fencing, and water development are suited to this unit. Use of grazing

systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

71—Tres Hermanos-Lehmans association, 1 to 15 percent slopes. This map unit is on piedmonts and hills. Areas are irregular in shape and are 300 to 2,000 acres in size. The native vegetation is mainly shrubs and grasses. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 50 percent Tres Hermanos gravelly sandy clay loam, 1 to 8 percent slopes, and 30 percent Lehmans gravelly sandy clay loam, 8 to 15 percent slopes. The Tres Hermanos soil is on piedmonts, and the Lehmans soil is on hills.

Included in this unit are small areas of Nickel soils on side slopes, Continental soils on alluvial fans, and Rock outcrop. Included areas make up about 20 percent of the total acreage.

The Tres Hermanos soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is reddish brown gravelly sandy clay loam about 3 inches thick. The subsoil is reddish brown clay loam and gravelly clay loam about 10 inches thick. The substratum to a depth of 60 inches or more is pink gravelly sandy loam.

Permeability of the Tres Hermanos soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Lehmans soil is shallow and well drained. It formed in residuum derived from acid igneous rock. Typically, the surface layer is strong brown gravelly sandy clay loam about 3 inches thick. The subsoil is reddish brown clay about 14 inches thick. Acid igneous rock is at a depth of 17 inches.

Permeability of the Lehmans soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on the Tres Hermanos soil is mainly bush muhly, black grama, Arizona cottontop, creosotebush, and plains bristlegrass. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, sand dropseed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 500 pounds per acre in favorable years to 125 pounds in unfavorable years.

The potential plant community on the Lehmans soil is mainly black grama, bush muhly, blue grama, and sideoats grama. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, tobosa, Hall panicum, and tridens, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 800 pounds per acre in favorable years to 200 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to bedrock of the Lehmans soil, low precipitation, and the hazard of soil blowing.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

72—Tres Hermanos-Upton complex, 0 to 5 percent slopes. This map unit is on alluvial fans, terraces, and foot slopes. Areas are oblong in shape and are 500 to 5,000 acres in size. The native vegetation is mainly shrubs and grasses. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 58 to 62 degrees F, and the average frost-free period is 180 to 220 days.

This unit is 40 percent Tres Hermanos fine sandy loam and 40 percent Upton gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Mimbres soils along intermittent streams, Mohave and Stellar soils on fans and plains, and Nickel soils on side slopes. Included areas make up about 20 percent of the total acreage.

The Tres Hermanos soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is light brown fine sandy loam about 2 inches thick. The subsoil is brown and light brown clay loam and gravelly clay loam about 16 inches thick. The substratum to a depth of 60 inches or more is pinkish white gravelly loam.

Permeability of this Tres Hermanos soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Upton soil is shallow and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is pale brown gravelly loam about 3 inches thick. The subsoil is brown gravelly clay loam about 9 inches thick. The substratum is brown very gravelly clay

loam about 2 inches thick. Indurated caliche is at a depth of about 14 inches.

Permeability of the Upton soil is moderate. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly bush muhly, black grama, Arizona cottontop, creosotebush, and plains bristlegrass. As the plant community deteriorates, the more desirable forage plants decrease and fluffgrass, sand dropseed, and burrograss, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 500 pounds per acre in favorable years to 125 pounds in unfavorable years.

This unit is suited to use as rangeland. The main limitations are depth to caliche in the Upton soil, low precipitation, and the hazard of soil blowing.

Range management practices such as deferred-rotation grazing, proper grazing use, and fencing are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

73—White House-Ruidoso association, 0 to 8 percent slopes. This map unit is on hillsides, in valleys, and on alluvial fans. Slope is 0 to 8 percent. Areas are irregular in shape and are 500 to 3,000 acres in size. The native vegetation is mainly grasses and forbs. Elevation is 4,800 to 5,500 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 57 to 60 degrees F, and the average frost-free period is 180 to 200 days.

This unit is 60 percent White House sandy clay loam, 1 to 8 percent slopes, and 20 percent Ruidoso clay loam, 0 to 5 percent slopes. The White House soil is on hillsides and alluvial fans, and the Ruidoso soil is in valleys and on alluvial fans.

Included in this unit are small areas of Mohave soils on alluvial fans, Stellar soils on plains, Riverwash along stream channels, and Conger soils on ridges and alluvial fans. Included areas make up about 20 percent of the total acreage.

The White House soil is deep and well drained. It formed in alluvium derived dominantly from conglomerate. Typically, the surface layer is strong brown sandy clay loam about 3 inches thick. The subsoil is yellowish red clay about 17 inches thick. The substratum is yellowish red very gravelly sandy clay loam about 5 inches thick over a buried subsoil and substratum that are yellowish red clay, sandy clay, and gravelly sandy clay.

Permeability of the White House soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Ruidoso soil is deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark brown clay loam about 10 inches thick. The subsoil is dark brown clay 40 inches thick. The substratum to a depth of 60 inches or more is brown sandy clay loam.

Permeability of the Ruidoso soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for livestock grazing.

The potential plant community on this unit is mainly tobosa, black grama, vine-mesquite, blue grama, and alkali sacaton. As the plant community deteriorates, the more desirable forage plants decrease and threeawn, burrograss, mat muhly, fluffgrass, and mesquite, which commonly make up only a small part of the potential plant community, increase. The average annual production of air-dry vegetation ranges from 700 pounds per acre in favorable years to 250 pounds in unfavorable years.

This unit is suited to use as rangeland. It has few limitations.

Range management practices such as deferred-rotation grazing, proper grazing use, and water development are suited to this unit. Use of grazing systems that vary the seasons of grazing and rest during successive years promotes a balanced plant community that provides high-quality forage throughout the year. Compacting the seedbed produces better contact between the seed and the soil. Deferring livestock grazing for a year permits more seedlings to become established.

Use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and pasture

By Paul M. Boden, conservation agronomist, Soil Conservation Service.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 7,200 acres of irrigated cropland and 800 acres of dryfarmed cropland are in the survey area. The major areas of irrigated cropland are along the Mimbres and Gila Rivers. Water is delivered to the cropland by canals from diversions and dams along these rivers. The supply of irrigation water generally is adequate for good crop yields, except along the lower part of the Mimbres River during August in some years.

The main crops are alfalfa for hay, improved grasses for pasture, and small grain. Other crops include vegetables, orchards, and grain sorghum. The potential for production of apples and cherries is good if the cropland is protected from frost damage.

The major objectives in cropland management are irrigating properly, maintaining good soil tilth and fertility, and controlling water erosion and soil blowing. Leaching and using soil amendments to reduce excess salinity or alkalinity, along with improved drainage, are needed on some soils.

A cropping system tailored to individual soils helps to maintain good tilth, structure, soil aeration, and fertility. Some soils can be used for a single crop for many years with little adverse effect on the yield. Other soils deteriorate rapidly when used for low-residue crops unless large amounts of organic matter from other sources are added to the soil annually. Rotation of crops also helps to control insects, disease, and weeds.

Timely applications of adequate amounts of irrigation water and avoiding overirrigation are essential for high yields and water conservation. Use of a properly designed irrigation system adapted to the soil and the crops grown is needed. Overirrigation leaches plant nutrients out of the root zone, contributes to excessive wetness of the lower lying soils, and reduces aeration in the root zone, which reduces yield.

Water erosion is not a serious problem on most irrigated soils in the area; however, poorly designed irrigation systems may contribute to excessive erosion on the more sloping soils. Land smoothing or leveling is desirable on some soils to reduce runoff. Placing irrigation furrows on the contour and bench leveling also reduce the risk of erosion.

Soil blowing is a major concern on the sandy soils in the area. It can best be controlled by leaving crop residue on the surface until the crop grown provides adequate ground cover. Cropping in strips perpendicular to the prevailing winds or establishing trees and other plants for windbreaks also helps to control soil blowing.

Yields of annual crops, hay crops, and pasture plants can be increased by use of other good management practices such as proper irrigation, use of improved varieties of crops, timely planting and harvesting, and using a good fertilizer program that is based on the needs of the crops. Among the other practices that contribute to increased yields is control of weeds, insects, and disease.

Good pasture management includes use of practices such as adequate fertilization, clipping after grazing to remove undesirable forage and weeds, harrowing to scatter manure, and rotation grazing. These practices greatly increase yields of pasture plants.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 3. In any given year, yields may be higher or lower than those indicated in the table because of variations in irrigation, water supply, and rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and

results of field trials and demonstrations are also considered.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 3 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Rangeland

By Walter G. Lindley, range conservationist, Soil Conservation Service.

About 90 percent of the survey area consists of rangeland. The native vegetation is predominantly grasses, forbs, and shrubs that are suitable for grazing or browsing. In addition, about 7 percent of the survey area is pinyon, juniper, and ponderosa pine woodland that produces grazable understory vegetation. Livestock production provides the principal agricultural income in Grant County. Yearlong cow and calf operations are dominant, and the average size of ranches is about 20 sections. All of the rangeland is suitable for grazing throughout the year. In winter, most ranchers supplement the forage produced with protein concentrates.

Management of livestock grazing to increase the ground cover, accumulate litter, and improve the vigor and reproduction of the more productive grasses and shrubs is highly desirable. Continuous yearlong grazing or grazing every year from April through October results in a deteriorated plant community that generally has less value as forage for livestock.

Proper range use and deferred grazing are needed to maintain a healthy, balanced plant community and to provide high-quality forage throughout the year. Periodic rest during different seasons of the year benefits different plants. Deferment of grazing in winter benefits shrubs such as mountainmahogany and winterfat. Rest in spring is beneficial to early forbs and cool-season grasses such as New Mexico feathergrass, pinyon ricegrass, and bottlebrush squirreltail. Rest in summer encourages the production and reproduction of warm-season grasses such as sideoats grama, little bluestem, black grama, and blue grama. Deferment in summer allows the cool-season grasses to complete their growth cycle. Rest in fall allows the warm-season plants to mature and to complete their growth cycle.

Varying the frequency and intensity of grazing is essential to the success of any grazing program. Effective livestock distribution can be accomplished by the use of fences, wells, pipelines, tanks, and salt licks.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

The detailed soil map units show, for each soil that is used as or is suited to use as rangeland, the total annual production of vegetation in favorable and unfavorable years and the characteristic vegetation.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture.

Characteristic vegetation is the dominant grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. It is listed in the detailed map units by common name. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Many times a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Common windbreak species are listed in each detailed soil map unit that is irrigated. These can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Recreation

The soils of the survey area are rated in table 4 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 4, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 4 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 7 and interpretations for dwellings without basements and for local roads and streets in table 6.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 5, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or

kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, sage grouse, meadowlark, and lark bunting.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building site development

Table 6 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary facilities

Table 7 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 7 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 7 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 7 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a

landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction materials

Table 8 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 8, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water management

Table 9 gives information on the soil properties and site features that affect water management. The degree

and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical

and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering index properties

Table 10 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each taxonomic unit under "Taxonomic units and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*4*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and chemical properties

Table 11 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 11, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and water features

Table 12 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 12 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil

boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*7*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 13, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning burnt, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplustolls (*Hapl*, meaning minimal horizonation, plus *ustoll*, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Cumulic* identifies the subgroup that has a thickened epipedon. An example is Cumulic Haplustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Cumulic Haplustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Taxonomic units and their morphology

In this section, each taxonomic unit recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each unit. The soil is compared with similar soils and with nearby soils of other units. A pedon, a small three-dimensional area of soil, that is typical of the units in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*6*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*7*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the unit.

The map units of each taxonomic unit are described in the section "Detailed soil map units."

Abrazo series

The soils in the Abrazo series are classified as Aridic Argiustolls, fine, mixed, mesic. These moderately deep, well drained soils formed in colluvium and residuum derived mainly from acid igneous rock. They are on mountains, ridges, and hills. Slope is 3 to 45 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of an Abrazo very cobbly clay loam in an area of Abrazo-Luzena complex, 15 to 45 percent slopes; about 2 miles south of Bayard; SE1/4NW1/4 of sec. 7, T. 18 S., R. 12 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) very cobbly clay loam, very dark brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine interstitial pores; thin patchy clay films; 40 percent cobbles and gravel; neutral (pH 7.2); clear smooth boundary.

B21t—2 to 9 inches; dark brown (7.5YR 4/2) clay, very dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; common very fine tubular pores; thin continuous clay films; mildly alkaline (pH 7.4); clear smooth boundary.

B22t—9 to 20 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate coarse prismatic structure parting to strong coarse subangular blocky; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; thick continuous clay films; mildly alkaline (pH 7.6); clear smooth boundary.

B23t—20 to 27 inches; dark reddish gray (5YR 4/2) clay, dark reddish gray (5YR 4/2) moist; strong medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; thin continuous clay films; moderately alkaline (pH 8.0); clear wavy boundary.

R—27 inches; acid igneous bedrock.

The thickness of the solum and depth to bedrock range from 21 to 40 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. It is cobbly clay loam, very cobbly clay loam, or sandy loam.

The B2t horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 or 3.

Anthony series

The soils in the Anthony series are classified as Typic Torrifluvents, coarse-loamy, mixed (calcareous), thermic. These deep, well drained soils formed in stratified alluvium derived from mixed sources. They are on flood plains. Slope is 1 to 3 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of Anthony fine sandy loam, 1 to 3 percent slopes; NE1/4SW1/4NW1/4 of sec. 6, T. 18 S., R. 18 W.

A1—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; single grained; loose; common fine roots; many fine interstitial pores; noncalcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1—4 to 13 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common fine roots; few fine interstitial pores; slightly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C2—13 to 15 inches; light brownish gray (10YR 6/2) loamy fine sand, dark brown (10YR 4/2) moist; single grained; loose; common fine roots; few fine interstitial pores; mildly alkaline (pH 7.8); abrupt smooth boundary.

C3—15 to 19 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common fine roots; few fine tubular pores; slightly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C4—19 to 27 inches; light brownish gray (10YR 6/2) sand, dark brown (10YR 4/2) moist; single grained; loose; few fine roots; many fine interstitial pores; mildly alkaline (pH 7.8); abrupt smooth boundary.

C5—27 to 29 inches; grayish brown (10YR 5/2) silty clay, dark brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few very fine roots; few fine tubular pores; slightly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C6—29 to 36 inches; brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common fine tubular pores; slightly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C7—36 to 39 inches; pale brown (10YR 6/3) sand, dark brown (10YR 4/3) moist; single grained; loose; common fine and medium roots; many fine interstitial pores; mildly alkaline (pH 7.8); abrupt smooth boundary.

C8—39 to 60 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and slightly plastic; common fine and medium roots; common fine tubular pores; strongly calcareous; mildly alkaline (pH 7.8).

The profile has value of 5 or 6 when dry and 3 or 4 when moist, and it has chroma of 2 or 3. Anthony soils are subject to rare, very brief periods of flooding during June through September.

Arizo series

The soils in the Arizo series are classified as Typic Torriorthents, sandy-skeletal, mixed, thermic. These deep, excessively drained soils formed in alluvium derived from mixed sources. They are on flood plains and alluvial fans. Slope is 0 to 5 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of an Arizo loamy sand in an area of Mimbres-Arizo-Riverwash association, 0 to 5 percent slopes; about 12 miles southeast of Hurley; NE1/4SW1/4 of sec. 24, T. 20 S., R. 12 W.

A11—0 to 2 inches; brown (10YR 5/3) loamy sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; slightly calcareous; neutral (pH 7.2); clear smooth boundary.

A12—2 to 12 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; slightly calcareous; neutral (pH 7.2); clear smooth boundary.

C1—12 to 18 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; slightly calcareous; neutral (pH 7.2); clear smooth boundary.

C2—18 to 60 inches; grayish brown (10YR 5/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grained; loose; few very fine roots; many very fine, fine, and medium interstitial pores; mildly alkaline (pH 7.4).

The A horizon has value of 5 or 6 when dry, and it has chroma of 2 or 3.

The C horizon has value of 5 or 6 when dry. It is very gravelly sand or very gravelly loamy sand. In some areas, the reaction is influenced by drainage from copper smelters.

The Arizo soils are subject to frequent, very brief periods of flooding during March through September.

Boysag series

The soils in the Boysag series are classified as Lithic Ustollic Haplargids, clayey, mixed, mesic. These shallow, well drained soils formed in residuum and colluvium derived mainly from conglomerate. They are on hills and ridges. Slope is 3 to 35 percent. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of Boysag clay loam, 15 to 35 percent slopes; about 7 miles southwest of Silver City; NE1/4SW1/4 of sec. 10, T. 18 S., R. 14 W.

A1—0 to 2 inches; reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/4) moist; moderate fine angular blocky structure; soft, friable, sticky and plastic; many fine roots; many fine interstitial pores; mildly alkaline (pH 7.8); clear smooth boundary.

B2t—2 to 8 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; strong medium subangular blocky structure; hard, firm, sticky and plastic; many fine roots; many fine interstitial and tubular pores; moderately alkaline (pH 8.0); clear smooth boundary.

B3t—8 to 14 inches; reddish brown (5YR 4/4) gravelly clay, dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; common very fine and fine interstitial and tubular pores; strongly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

R—14 inches; strongly cemented conglomerate.

The thickness of the solum and depth to bedrock range from 6 to 20 inches.

The A horizon, where present, has hue of 5YR to 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4. It is clay loam or sandy clay loam.

The B horizon has hue of 5YR or 7.5YR, value of 3 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 6. It is gravelly clay, gravelly heavy clay loam, clay, or heavy clay loam. It is mildly alkaline or moderately alkaline.

The bedrock commonly is soft in the upper part but becomes harder as depth increases.

Bucklebar series

The soils in the Bucklebar series are classified as Typic Haplargids, fine-loamy, mixed, thermic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on alluvial fans and plains. Slope is 1 to 5 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Bucklebar coarse sandy loam in an area of Bucklebar-Sonoita-Continental association, 1 to 8 percent slopes; about 20 miles northwest of Hachita; NW1/4SW1/4NE1/4 of sec. 14, T. 24 S., R. 16 W.

A1—0 to 3 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; weak medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; many fine pores; noncalcareous; neutral (pH 6.8); clear smooth boundary.

B1t—3 to 7 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak medium and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine roots; many fine pores; common clay bridges between sand grains; noncalcareous; neutral (pH 6.8); clear smooth boundary.

B21t—7 to 16 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and plastic; common fine roots; common fine pores; common clay bridges between sand grains and many clay films on faces of peds; noncalcareous; mildly alkaline (pH 7.5); gradual smooth boundary.

B22t—16 to 27 inches; strong brown (7.5YR 5/6) clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; few fine roots; common fine and medium pores; common thin clay films on faces of peds; noncalcareous; mildly alkaline (pH 7.8); gradual smooth boundary.

B3tca—27 to 34 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 4/4) moist; hard, friable, slightly sticky and plastic; few fine pores; few thin clay films; slightly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

Cca—34 to 60 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; hard, friable, slightly sticky and slightly plastic; common fine pores; moderately calcareous; moderately alkaline (pH 8.2).

The solum is 20 to 40 inches thick. Gravel is present in some pedons, but it is less than 15 percent of the profile.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 3 or 4.

The Bt horizon has hue of 5YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 to 6.

The C horizon is sandy clay loam, clay loam, sandy loam, or gravelly sandy loam. A buried soil is in many pedons below a depth of 40 inches.

Carnero series

The soils in the Carnero series are classified as Aridic Argiustolls, fine, mixed, mesic. These moderately deep, well drained soils formed in residuum derived mainly from shale and sandstone and are altered by local alluvium. They are on ridges, hills, and valley sides. Slope is 3 to 10 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Carnero fine sandy loam in an area of Carnero-Santa Fe complex, 5 to 15 percent slopes; about 0.2 mile north and 0.1 mile west of the southeast corner of sec. 15, T. 17 S., R. 14 W.

A1—0 to 3 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine pores; neutral (pH 6.8); clear smooth boundary.

B1t—3 to 6 inches; brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; common fine and very fine roots; few fine and very fine pores; neutral (pH 7.0); clear smooth boundary.

B21t—6 to 12 inches; brown (10YR 4/3) heavy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; few fine and very fine pores; thin continuous clay films; mildly alkaline (pH 7.6); clear smooth boundary.

B22t—12 to 27 inches; brown (10YR 4/3) heavy clay loam, brown (10YR 4/3) moist; strong coarse subangular blocky structure; very hard, friable, sticky and plastic; common fine and very fine roots; few fine and very fine pores; thin continuous clay films; mildly alkaline (pH 7.8); clear smooth boundary.

B23t—27 to 34 inches; brown (10YR 5/4) silty clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine pores; thin patchy clay films; slightly calcareous; moderately alkaline (pH 8.0); gradual smooth boundary.

Cr—34 to 40 inches; partially weathered sandstone and shale that breaks to brownish yellow (10YR 6/6) silty clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; very few very fine roots in cracks; few fine and very fine pores; thin patchy clay films along cracks; slightly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

R—40 inches; hard sandstone.

The thickness of the solum and depth to soft sandstone and shale range from 25 to 34 inches. The A horizon has chroma of 2 or 3. The Bt horizon has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 3 or 4. It is clay or heavy clay loam.

Conger series

The soils in the Conger series are classified as Ustollic Paleorthids, loamy, mixed, thermic, shallow. These well drained soils are shallow to indurated caliche. They formed in alluvium derived from mixed sources. They are on ridges, terraces, and alluvial fans. Slope is 0 to 5 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air

temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of Conger gravelly loam, 0 to 5 percent slopes; about 6 miles southeast of Hurley; NE1/4NE1/4 of sec. 28, T. 19 S., R. 12 W.

A11—0 to 2 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose, slightly sticky and slightly plastic; many very fine roots; many very fine and fine interstitial pores; moderately alkaline granular structure; soft, very friable, slightly sticky

A12—2 to 13 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores; strongly alkaline (pH 8.8); abrupt wavy boundary.

C1cam—13 inches; strongly indurated caliche.

The A11 horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 or 3. It is fine sandy loam or gravelly loam and is 10 to 25 percent coarse fragments. The A12 horizon is clay loam or sandy clay loam.

The C1cam horizon is at a depth of 10 to 20 inches. It is 10 inches thick or more.

Continental series

The soils in the Continental series are classified as Typic Haplargids, fine, mixed, thermic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on toe slopes of plains, along drainageways, and in depressional areas. Slope is 0 to 2 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Continental sandy loam in an area of Bucklebar-Sonoita-Continental association, 1 to 8 percent slopes; about 19 miles northwest of Hachita; SW1/4SW1/4SE1/4 of sec. 22, T. 24 S., R. 16 W.

A—0 to 7 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; many fine pores and few medium pores; noncalcareous; neutral (pH 7.0); clear smooth boundary.

B21t—7 to 20 inches; reddish brown (5YR 5/4) sandy clay, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; common fine pores; few thin clay films on faces of peds and common bridges between sand grains; noncalcareous; neutral (pH 7.0); clear smooth boundary.

B22t—20 to 39 inches; light reddish brown (5YR 6/4) clay, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; common fine pores; many thin clay films on faces of peds; noncalcareous; mildly alkaline (pH 7.8); gradual wavy boundary.

Cca—39 to 60 inches; light reddish brown (5YR 6/4) silty clay loam, reddish brown (5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many fine pores; strongly calcareous; moderately alkaline (pH 8.4).

The thickness of the solum is 26 to 50 inches.

The A horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 4 to 6. It is sandy loam or sandy clay loam.

The Bt horizon has hue of 2.5YR or 5YR, value of 3 to 6 when dry and 3 to 5 when moist, and chroma of 4 to 6. The upper 20 inches of the horizon averages 35 to 50 percent clay.

The Cca horizon is clay loam, silty clay loam, sandy clay loam, or gravelly sandy clay loam.

Dagflat series

The soils in the Dagflat series are classified as Aridic Argiustolls, fine-loamy, mixed, mesic. These moderately deep, well drained soils formed in residuum derived mainly from acid igneous rock. They are in intraridge valleys and on hills. Slope is 1 to 15 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 15 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Dagflat loam in an area of Dagflat-Santa Fe complex, 1 to 25 percent slopes; about 0.3 mile south and 0.3 mile east of the northwest corner of sec. 5, T. 18 S., R. 13 W.

A11—0 to 3 inches; brown (7.5YR 4/3) loam, dark brown (7.5YR 3/2) moist; strong fine granular structure; soft, friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine and very fine interstitial pores; noncalcareous; slightly acid (pH 6.4); clear smooth boundary.

A12—3 to 8 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine and very fine pores; noncalcareous; neutral (pH 6.8); clear smooth boundary.

B21t—8 to 13 inches; dark reddish gray (5YR 4/2) sandy clay loam, dark reddish brown (5YR 3/2) moist; strong medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine and very fine pores; thin continuous clay films; noncalcareous; mildly alkaline (pH 7.6); gradual smooth boundary.

B22t—13 to 19 inches; brown (7.5YR 4/3) sandy clay loam, dark brown (7.5YR 3/3) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; thin continuous clay films; noncalcareous; mildly alkaline (pH 7.6); gradual smooth boundary.

B23t—19 to 31 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; thin continuous clay films; noncalcareous; mildly alkaline (pH 7.6); abrupt irregular boundary.

R—31 inches; igneous bedrock.

The depth to bedrock and thickness of the solum range from 21 to 40 inches.

The A horizon has hue of 5YR to 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3.

The B2t horizon has hue of 5YR or 7.5YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4. It is light clay loam or sandy clay loam. Some pedons do not have gravel in the lower part of the B2t horizon.

The upper few inches of the R horizon is slightly weathered.

Denver Variant

The Denver Variant soils are classified as Torrertic Argiustolls, fine, mixed, mesic. These deep, well drained soils formed in fine textured alluvium derived mainly from conglomerate. They are on ridges, hills, and toe slopes. Slope is 1 to 9 percent. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 15 inches. The average annual air temperature is 53 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Denver Variant clay loam in an area of Lonti-Denver Variant complex, 1 to 25 percent slopes; about 0.6 mile west and 0.3 mile north of the southeast corner of sec. 17, T. 18 S., R. 14 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine tubular pores; noncalcareous; neutral (pH 6.8); clear smooth boundary.

B21t—2 to 11 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; common fine and very fine roots; few fine tubular pores; thin patchy clay films on faces of peds; noncalcareous; mildly alkaline (pH 7.6); gradual smooth boundary.

B22t—11 to 21 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; common fine and very fine roots; few very fine tubular pores; thin patchy clay films on faces of peds; noncalcareous; mildly alkaline (pH 7.6); gradual smooth boundary.

B23t—21 to 30 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 4/2) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; few fine and very fine roots; few fine tubular pores; thin patchy clay films on faces of peds; noncalcareous; moderately alkaline (pH 8.4); clear wavy boundary.

C1—30 to 60 inches; brown (7.5YR 5/4) gravelly clay, dark brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine interstitial pores; noncalcareous; moderately alkaline (pH 8.4).

The solum is 20 to 40 inches thick.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry, and chroma of 2 or 3.

The B horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry, and chroma of 2 to 6. Some pedons have a paralithic contact at a depth of 50 to 60 inches.

Ellicott series

The soils in the Ellicott series are classified as Ustic Torrifluvents, sandy, mixed, mesic. These deep, somewhat excessively drained soils formed in alluvium derived from mixed sources. They are on flood plains, in stream channels, and on alluvial fans. Slope is 0 to 3 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of an Ellicott gravelly sand in an area of Paymaster-Ellicott complex, 1 to 3 percent slopes; about 0.2 mile south and 0.2 mile east of the northwest corner of sec. 18, T. 18 S., R. 13 W.

C1—0 to 6 inches; dark yellowish brown (10YR 4/4) gravelly sand, dark yellowish brown (10YR 3/4) moist; single grained; loose; few fine roots; 20 percent gravel; noncalcareous; mildly alkaline (pH 7.6); clear smooth boundary.

C2—6 to 60 inches; dark yellowish brown (10YR 4/4) sand, dark yellowish brown (10YR 3/4) moist; single grained; loose; few fine roots; 15 percent gravel; noncalcareous; mildly alkaline (pH 7.6).

The profile is stratified sandy loam, loamy sand, gravelly sand, gravelly loamy sand, or gravelly sandy loam. Thin lenses of finer textured material such as loam or silt loam are in some pedons.

The Ellicott soils are subject to frequent, very brief periods of flooding during July through September.

Encierro series

The soils in the Encierro series are classified as Lithic Argiustolls, clayey, mixed, mesic. These shallow, well drained soils formed in residuum derived mainly from limestone. They are on hills and ridges. Slope is 8 to 35 percent. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of an Encierro gravelly loam in an area of Encierro-Rock outcrop complex, 15 to 35 percent slopes; about 0.3 mile east and 0.1 mile south of the northwest corner of sec. 4, T. 18 S., R. 14 W.

A1—0 to 2 inches; dark brown (7.5YR 4/2) gravelly loam, dark brown (7.5YR 3/2) moist; strong fine granular structure; soft, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine interstitial pores; 25 percent coarse fragments; mildly alkaline (pH 7.8); clear smooth boundary.

B21t—2 to 6 inches; dark brown (7.5YR 4/2) gravelly clay, dark brown (7.5YR 3/2) moist; strong fine subangular blocky structure; very hard, friable, sticky and plastic; many very fine and fine roots; few fine tubular pores; thin continuous clay films on faces of peds; 15 percent coarse fragments; mildly alkaline (pH 7.8); clear wavy boundary.

B22t—6 to 9 inches; dark reddish brown (5YR 3/4) gravelly clay, dark reddish brown (5YR 3/4) moist; strong fine subangular blocky structure; very hard, friable, sticky and plastic; many very fine and fine roots; few fine tubular pores; thin continuous clay films; 15 percent coarse fragments; mildly alkaline (pH 7.8); clear irregular boundary.

R—9 inches; fractured dolomitic limestone.

The depth to bedrock is 7 to 20 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry, and chroma of 2 or 3.

The B horizon has hue of 5YR or 7.5YR, value of 3 or 4 when moist, and chroma of 3 or 4. It is gravelly clay, clay, or clay loam.

Gaddes series

The soils in the Gaddes series are classified as Ustollic Haplargids, fine-loamy, mixed, mesic. These moderately deep, well drained soils formed in residuum derived mainly from acid igneous rock. They are on the sides of ridges. Slope is 5 to 35 percent. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 15 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Gaddes gravelly sandy loam in an area of Gaddes-Santa Fe-Rock outcrop complex, 15 to 45 percent slopes; about 0.8 mile south and 0.1 mile east of the northwest corner of sec. 3, T. 17 S., R. 14 W.

A1—0 to 2 inches; brown (10YR 4/3) gravelly sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; noncalcareous; neutral (pH 6.8); clear smooth boundary.

B21t—2 to 6 inches; brown (7.5YR 4/4) gravelly sandy clay loam, dark brown (7.5YR 3/4) moist; strong coarse subangular blocky structure parting to moderate fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine pores; few thin clay films on coarse fragments and sand grains; noncalcareous; neutral (pH 6.6); clear wavy boundary.

B22t—6 to 12 inches; brown (7.5YR 4/4) gravelly sandy clay loam, strong brown (7.5YR 4/6) moist; moderate coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common medium and fine roots; few very fine pores; common thin clay films on coarse fragments and sand grains; noncalcareous; slightly acid (pH 6.2); clear wavy boundary.

B23t—12 to 22 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam, strong brown (7.5YR 5/6) moist; moderate coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine pores; common thin clay films on coarse fragments and sand grains; noncalcareous; slightly acid (pH 6.2); clear wavy boundary.

C1—22 inches; weathered granite.

The thickness of the solum and depth to weathered granite range from 20 to 40 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 to 4.

The Bt horizon has hue of 5YR or 7.5YR, value of 3 to 6 when dry or moist, and chroma of 3 to 6. It is gravelly sandy clay loam or gravelly clay loam.

Gila Variant

The Gila Variant soils are classified as Typic Torrifluvents, fine-loamy, mixed (calcareous), thermic. These deep, well drained soils formed in stratified alluvium derived from mixed sources. They are on flood plains, alluvial fans, and side slopes. Slope is 0 to 3 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of Gila Variant fine sandy loam, 1 to 3 percent slopes; about 3 miles southwest of Redrock; SW1/4NW1/4 of sec. 32, T. 18 S., R. 18 W.

Ap1—0 to 2 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; few fine tubular pores; slightly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Ap2—2 to 8 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; few fine tubular pores; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

Ap3—8 to 14 inches; light gray (10YR 7/2) loam, dark brown (10YR 3/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; many fine roots; few fine tubular pores; slightly effervescent; mildly alkaline (pH 7.8); clear wavy boundary.

C1—14 to 26 inches; light yellowish brown (10YR 6/4) silty clay loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine tubular pores; slightly effervescent; mildly alkaline (pH 7.8); abrupt smooth boundary.

C2—26 to 28 inches; pale brown (10YR 6/3) sandy clay loam, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; many fine roots; few fine tubular pores; slightly effervescent; mildly alkaline (pH 7.8); abrupt smooth boundary.

C3—28 to 37 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 3/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common fine roots; common medium tubular pores; slightly effervescent; mildly alkaline (pH 7.8); abrupt smooth boundary.

C4—37 to 60 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common fine roots; many fine interstitial pores; slightly effervescent; mildly alkaline (pH 7.8).

The profile has value of 5 to 7 when dry and 3 to 5 when moist, and it has chroma of 2 to 4. It is stratified and ranges from sand to clay, but averages loam or clay loam. Gila Variant soils are subject to occasional, very brief periods of flooding during April through October.

Graham series

The soils in the Graham series are classified as Lithic Argiustolls, clayey, montmorillonitic, thermic. These shallow, well drained soils formed in fine textured residuum derived mainly from igneous rock. They are on hills. Slope is 5 to 25 percent. Elevation is 4,500 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Graham clay loam in an area of Rock outcrop-Graham association, 5 to 25 percent slopes; about 18 miles northwest of Redrock; SW1/4NW1/4SE1/4 of sec. 5, T. 17 S., R. 21 W.

A1—0 to 1 inch; brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; common medium roots; many fine interstitial pores; noncalcareous; mildly alkaline (pH 7.6); abrupt smooth boundary.

B21t—1 inch to 4 inches; dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; soft, friable, sticky and plastic; common medium roots; many fine tubular pores; noncalcareous; mildly alkaline (pH 7.6); clear smooth boundary.

B22t—4 to 9 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; common medium tubular pores; noncalcareous; mildly alkaline (pH 7.8); clear smooth boundary.

B23t—9 to 13 inches; dark reddish brown (5YR 3/3) clay, dark reddish brown (5YR 3/3) moist; strong medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; common fine tubular pores; noncalcareous; mildly alkaline (pH 7.8); clear wavy boundary.

R—13 inches; andesite.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4 when dry, and chroma of 2 or 3.

The B horizon has value of 3 to 5 when dry, and it has chroma of 2 or 3. Depth to lithic contact is 10 to 20 inches.

Guy series

The soils in the Guy series are classified as Aridic Calciustolls, coarse-loamy, mixed, mesic. These deep, well drained soils formed in old alluvium and eolian

material derived mainly from conglomerate. They are on ridges and hills. Slope is 1 to 35 percent. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of Guy very cobbly loam, 15 to 35 percent slopes; about 0.7 mile south and 0.15 mile east of the northwest corner of sec. 36, T. 17 S., R. 15 W.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine pores; 15 percent gravel and 40 percent cobbles; moderately calcareous; moderately alkaline (pH 8.2); clear wavy boundary.

C1ca—8 to 23 inches; light gray (10YR 7/2) gravelly loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine pores; 20 percent gravel and 10 percent cobbles; strongly calcareous; moderately alkaline (pH 8.4); gradual wavy boundary.

C2ca—23 to 31 inches; light gray (10YR 7/2) gravelly sandy loam, pale brown (10YR 6/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few fine pores; 30 percent gravel; strongly calcareous; moderately alkaline (pH 8.4); gradual smooth boundary.

C3—31 to 60 inches; light gray (10YR 7/2) gravelly loamy sand, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine interstitial pores; 30 percent gravel; moderately calcareous; moderately alkaline (pH 8.3).

The depth to the Cca horizon is 7 to 18 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 or 3. It is gravelly loam or very cobbly loam and is 20 to 65 percent gravel and cobbles.

The Cca horizon has hue of 7.5YR or 10YR, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 2 or 3. It is mainly gravelly loam, gravelly sandy loam, or sandy loam.

Haverson series

The soils in the Haverson series are classified as Ustic Torrifluvents, fine-loamy, mixed (calcareous), mesic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on flood plains and stream terraces. Slope is 0 to 1 percent. Elevation is 5,000 to 6,500 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of Haverson silty clay loam, 0 to 1 percent slopes; about 4 miles southeast of Buckhorn; NE1/4NE1/4SE1/4 of sec. 11, T. 15 S., R. 18 W.

A1—0 to 2 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular and interstitial pores; violently calcareous; strongly alkaline (pH 8.6); abrupt smooth boundary.

C1—2 to 10 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; few very fine interstitial pores; strongly calcareous; strongly alkaline (pH 8.6); abrupt smooth boundary.

C2—10 to 14 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grained; loose; many very fine roots; many very fine interstitial pores; strongly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

C3—14 to 23 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine interstitial pores; strongly calcareous; strongly alkaline (pH 8.6); abrupt smooth boundary.

C4—23 to 26 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; single grained; loose; few very fine roots; many very fine interstitial pores; slightly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

C5—26 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine vesicular pores; strongly calcareous; strongly alkaline (pH 8.6).

The profile is very highly stratified and ranges from clay to sand, but averages silty clay loam. Reaction ranges from moderately alkaline in the coarser textured layers to very strongly alkaline in the finer textured layers.

The Haverson soils are subject to rare, very brief periods of flooding during July through September.

Hondale series

The soils in the Hondale series are classified as Typic Natrargids, fine, mixed, thermic. These deep, well drained soils formed in alluvium derived from mixed sources. They are in bolsons and on flats. Slope is 0 to 3 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 10 inches. The average annual air

temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Hondale sandy loam in an area of Hondale-Verhalen association, 0 to 3 percent slopes; about 22 miles northwest of Hachita; NW1/4NW1/4NW1/4 of sec. 6, T. 25 S., R. 16 W.

A1—0 to 5 inches; light brown (7.5YR 6/4) sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; many fine pores; noncalcareous; strongly alkaline (pH 8.6); abrupt smooth boundary.

A2—5 to 8 inches; pinkish gray (7.5YR 7/2) sandy clay loam, dark brown (7.5YR 4/2) moist; strong medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; many fine vesicular pores; noncalcareous; strongly alkaline (pH 8.6); abrupt smooth boundary.

A&B—8 to 10 inches; pinkish gray (7.5YR 7/2) clay loam, brown (7.5YR 5/2) moist; strong medium subangular blocky structure; slightly hard, friable, sticky and plastic; many fine roots; many fine tubular pores; noncalcareous; strongly alkaline (pH 8.6); abrupt smooth boundary.

B21t—10 to 13 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; weak moderate prismatic structure parting to strong fine angular blocky; hard, friable, sticky and plastic; many fine roots; many fine tubular pores; strongly calcareous; strongly alkaline (pH 8.8); clear smooth boundary.

B22t—13 to 19 inches; light brown (7.5YR 6/4) clay loam, dark brown (7.5YR 4/4) moist; weak moderate prismatic structure parting to moderate fine angular blocky; slightly hard, friable, sticky and plastic; many fine roots; many fine tubular pores; strongly calcareous; strongly alkaline (pH 8.8); clear smooth boundary.

B3tca—19 to 26 inches; pink (7.5YR 7/4) clay loam, brown (7.5YR 5/4) moist; strong fine subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots; many fine tubular pores; strongly calcareous; strongly alkaline (pH 8.6); clear smooth boundary.

C1ca—26 to 32 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; few fine roots; many fine tubular pores; violently calcareous; strongly alkaline (pH 8.6); clear smooth boundary.

C2ca—32 to 51 inches; pinkish white (7.5YR 8/2) sandy clay, brown (7.5YR 5/2) moist; massive; slightly hard, friable, sticky and plastic; few fine roots; many fine tubular pores; violently calcareous; strongly alkaline (pH 8.6); clear smooth boundary.

C3ca—51 to 62 inches; pinkish gray (7.5YR 6/2) sandy clay loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, sticky and plastic; many fine tubular pores; violently calcareous; strongly alkaline (pH 8.6).

The A horizon, where present, has hue of 7.5YR or 10YR, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 2 or 3.

The B horizon has hue of 5YR to 10YR, value of 4 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is clay, silty clay, clay loam, silty clay loam, sandy clay loam, or sandy clay.

The Hondale soils are subject to rare, very brief periods of flooding during July through September.

Jonale series

The soils in the Jonale series are classified as Aridic Calciustolls, fine-loamy, mixed, mesic. These deep, well drained soils formed in old alluvium derived mainly from conglomerate. They are on hills. Slope is 15 to 35 percent. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 14 inches. The average annual air temperature is 51 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of Jonale sandy clay loam, 15 to 35 percent slopes; about 8 miles west of Silver City; NE1/4NW1/4SE1/4 of sec. 11, T. 18 S., R. 15 W.

A11—0 to 5 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine interstitial pores; slightly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

A12—5 to 10 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine interstitial pores; moderately calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

C1ca—10 to 16 inches; grayish brown (10YR 5/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores; 10 percent gravel; moderately calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

C2ca—16 to 60 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine interstitial pores; strongly calcareous; moderately alkaline (pH 8.4).

The depth to caliche is 7 to 20 inches, and the depth to conglomerate or shale is 40 inches or more. The profile is sandy clay loam, loam, silt loam, or clay loam.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 2 to 4. It is 15 to 40 percent calcium carbonate.

Judd series

The soils in the Judd series are classified as Typic Argiustolls, fine, mixed, mesic. These deep, well drained soils formed in residuum and old alluvium derived mainly from conglomerate. They are on plains and hills. Slope is 2 to 15 percent. Elevation is 5,000 to 6,000 feet. The average annual precipitation is 15 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Judd loam in an area of Judd-Manzano association, 1 to 15 percent slopes; about 1 mile south of Mule Creek; SE1/4SE1/4NE1/4 of sec. 6, T. 14 S., R. 20 W.

A—0 to 2 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine pores; noncalcareous; neutral (pH 7.0); clear smooth boundary.

B21t—2 to 8 inches; grayish brown (10YR 5/2) heavy clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; few thin clay films on faces of peds and in pores; noncalcareous; neutral (pH 7.0); clear smooth boundary.

B22t—8 to 18 inches; dark brown (10YR 3/3) clay, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; very hard, friable, sticky and plastic; common fine roots; common very fine tubular pores; many moderately thick clay films on faces of peds and in pores; noncalcareous; mildly alkaline (pH 7.5); gradual smooth boundary.

Cca—18 to 60 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores; strongly effervescent; strongly alkaline (pH 8.5).

Thickness of the solum and depth to the calcic horizon range from 13 to 25 inches. The mean annual soil temperature ranges from 49 to 59 degrees F.

The A horizon has value of 4 or 5 when dry and 3 or 4 when moist, and it has chroma of 1 to 3 when dry and 1 or 2 when moist.

The B horizon has hue of 7.5YR or 10YR, value of 3 to 5 when dry, and chroma of 1 to 4 when dry or moist. It is clay loam or clay.

The Cca horizon has value of 5 to 7 when dry, and it has chroma of 2 or 4 when dry or moist. It is loam, sandy clay loam, or clay loam. This horizon is more than 15 percent carbonates. It is as much as 35 percent gravel.

Lehmans series

The soils in the Lehmans series are classified as Lithic Haplargids, clayey, montmorillonitic, thermic. These shallow, well drained soils formed in residuum derived mainly from acid igneous rock. They are on hills. Slope is 5 to 15 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Lehmans gravelly sandy clay loam in an area of Tres Hermanos-Lehmans association, 1 to 15 percent slopes; about 14 miles northwest of Redrock; SW1/4SW1/4 of sec. 20, T. 17 S., R. 21 W.

A1—0 to 3 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam, brown (7.5YR 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; many very fine interstitial pores; 20 percent gravel; noncalcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

B21t—3 to 11 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; strong medium angular blocky structure; very hard, friable, very sticky and very plastic; common fine roots; common fine tubular pores; noncalcareous; mildly alkaline (pH 7.8); clear smooth boundary.

B22t—11 to 17 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; strong medium angular blocky structure; very hard, friable, very sticky and very plastic; common fine roots; many very fine tubular pores; mildly alkaline (pH 7.8); clear wavy boundary.

R—17 inches; rhyolite.

Depth to bedrock is 10 to 20 inches.

The A horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry, and chroma of 2 to 6.

The B horizon has hue of 5YR or 2.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 to 6.

Lithic Haplargids

Lithic Haplargids are shallow, well drained soils that formed in colluvium and residuum derived from sedimentary and igneous rock. They are on toe slopes, hills, and mountains. Slope is 5 to 75 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Reference pedon of Lithic Haplargids in an area of Lehmans-Lithic Haplargids complex, 5 to 15 percent slopes; about 21 miles south of Tyrone; SW1/4NE1/4NE1/4 of sec. 19, T. 22 S., R. 15 W.

A—0 to 2 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; many fine interstitial pores; noncalcareous; neutral (pH 6.6); abrupt smooth boundary.

B2t—2 to 11 inches; dark brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4) moist; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many fine tubular pores; noncalcareous; neutral (pH 7.0); abrupt smooth boundary.

R—11 inches; igneous rock.

These soils are extremely variable in characteristics. The depth to bedrock ranges from 5 to 20 inches. The profile is 10 to 35 percent clay and 0 to 45 percent rock fragments. These soils are noncalcareous to strongly calcareous and are neutral to strongly alkaline.

Lithic Ustorthents

Lithic Ustorthents are shallow, well drained soils that formed in colluvium and residuum derived mainly from acid igneous rock. They are on hills and mountains. Slope is 15 to 65 percent. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Reference pedon of Lithic Ustorthents in an area of Rock outcrop-Lithic Ustorthents complex, 15 to 65 percent slopes; about 6 miles east of Mule Creek; NE1/4NE1/4SW1/4 of sec. 12, T. 14 S., R. 20 W.

A—0 to 2 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; common fine interstitial pores; noncalcareous; neutral (pH 7.2); abrupt smooth boundary.

C—2 to 7 inches; yellowish brown (10YR 5/4) gravelly loam, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; few fine interstitial pores; 20 percent gravel; noncalcareous; mildly alkaline (pH 7.4); abrupt smooth boundary.

R—7 inches; acid igneous rock.

These soils are extremely variable in characteristics. The depth to bedrock ranges from 5 to 20 inches.

Lonti series

The soils in the Lonti series are classified as Ustollic Haplargids, fine, mixed, mesic. These deep, well drained soils formed in old alluvium derived from conglomerate. They are on hills and pediments. Slope is 0 to 35 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of Lonti gravelly loam, 15 to 35 percent slopes; about 0.4 mile north and 0.4 mile east of the southwest corner of sec. 23, T. 18 S., R. 14 W.

A1—0 to 4 inches; brown (7.5YR 4/4) gravelly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; many fine vesicular pores; 15 percent gravel; noncalcareous; neutral (pH 6.7); clear smooth boundary.

B21t—4 to 17 inches; brown (7.5YR 4/4) gravelly clay, brown (7.5YR 4/4) moist; strong fine subangular blocky structure; hard, friable, sticky and plastic; common fine roots; few fine pores; thin continuous clay films on faces of peds; 15 percent gravel; noncalcareous; neutral (pH 7.2); gradual smooth boundary.

B22t—17 to 23 inches; reddish brown (5YR 5/4) gravelly heavy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; few fine pores; many thin clay films on faces of peds; 20 percent gravel; noncalcareous; neutral (pH 7.2); clear smooth boundary.

C1ca—23 to 42 inches; reddish yellow (7.5YR 6/6) gravelly sandy clay loam, light brown (7.5YR 6/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine pores; 35 percent gravel; few soft lime masses; slightly calcareous; moderately alkaline (pH 8.0); gradual smooth boundary.

C2—42 to 60 inches; reddish yellow (7.5YR 6/6) gravelly clay loam, light brown (7.5YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine pores; 35 percent gravel; noncalcareous; moderately alkaline (pH 8.0).

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4. It is gravelly loam, gravelly sandy clay loam, or gravelly clay loam. The horizon is slightly acid to moderately alkaline.

The B horizon has hue of 5YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 3 to 6. It is gravelly clay loam, gravelly sandy clay, gravelly clay, clay, or heavy clay loam. The upper 20 inches of the B horizon averages more than 35 percent clay. The horizon commonly is noncalcareous, but in some pedons it is calcareous in the lower part. It is neutral to moderately alkaline.

The C horizon has hue of 5YR or 7.5YR, value of 5 to 8 when dry and 4 to 7 when moist, and chroma of 4 to 6. It is gravelly clay loam, gravelly sandy clay loam, or gravelly sandy loam.

Luzena series

The soils in the Luzena series are classified as Lithic Argiustolls, clayey, montmorillonitic, mesic. These shallow, well drained soils formed in colluvium and residuum derived from andesite and rhyolite. They are on hills. Slope is 5 to 60 percent. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Luzena gravelly clay loam in an area of Rock outcrop-Luzena association, 25 to 60 percent slopes; about 20 miles southwest of Mule Creek; NE1/4NW1/4SE1/4 of sec. 19, T. 16 S., R. 21 W.

A1—0 to 3 inches; brown (7.5YR 4/2) gravelly clay loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; many fine interstitial pores; 20 percent gravel; noncalcareous; neutral (pH 7.2); abrupt smooth boundary.

B21t—3 to 6 inches; brown (7.5YR 4/2) gravelly clay loam, dark brown (7.5YR 3/2) moist; moderate medium angular blocky structure; soft, friable, slightly sticky and plastic; commom fine roots; common fine tubular and interstitial pores; noncalcareous; mildly alkaline (pH 7.4); clear smooth boundary.

B22t—6 to 10 inches; brown (7.5YR 5/2) clay, brown (7.5YR 4/2) moist; moderate medium subangular blocky structure; soft, friable, sticky and plastic; common fine roots; common fine tubular and interstitial pores; noncalcareous; mildly alkaline (pH 7.4); abrupt smooth boundary.

R—10 inches; andesite.

The depth to bedrock is 7 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when dry, and chroma of 2 or 3. It is gravelly clay loam, gravelly loam, cobbly loam, or very gravelly sandy clay loam.

The B horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 or 3.

Majada Variant

The Majada Variant soils are classified as Aridic Argiustolls, loamy-skeletal, mixed, mesic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on terrace remnants and ridges. Slope is 1 to 15 percent. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 15 inches. The average annual air temperature is 52 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Majada Variant cobbly loam in an area of Sanloren-Majada Variant complex, 1 to 15 percent slopes; about 11 miles northeast of San Lorenzo; NE1/4 of sec. 10, T. 16 S., R. 11 W.

A11—0 to 2 inches; brown (10YR 5/3) cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores; 15 percent cobbles; neutral (pH 7.0); clear wavy boundary.

A12—2 to 11 inches; brown (10YR 5/3) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine tubular pores; 25 percent cobbles; neutral (pH 7.0); clear wavy boundary.

B2t—11 to 60 inches; brown (7.5YR 5/4) very cobbly heavy loam, dark brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; 45 percent cobbles; neutral (pH 7.2).

The thickness of the solum is 40 inches or more.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3.

The B horizon has hue of 7.5YR or 10YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 3 or 4. It is very cobbly loam or very cobbly clay loam. The horizon is 25 to 55 percent cobbles and 5 to 25 percent gravel.

Manzano series

The soils in the Manzano series are classified as Cumulic Haplustolls, fine-loamy, mixed, mesic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on flood plains, along intermittent streams, in depressional areas, in valleys, and on alluvial fans and terraces. Slope is 0 to 5 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of Manzano loam, 1 to 3 percent slopes; about 1 mile north of Central; NE1/4SW1/4SW1/4 of sec. 25, T. 17 S., R. 13 W.

A1—0 to 3 inches; brown (10YR 4/3) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine interstitial pores; noncalcareous; moderately alkaline (pH 8.0); clear smooth boundary.

B2—3 to 26 inches; brown (10YR 4/3) clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; many fine interstitial and tubular pores; noncalcareous; moderately alkaline (pH 8.0); clear smooth boundary.

C1ca—26 to 36 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 3/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; slightly calcareous; moderately alkaline (pH 8.4); gradual smooth boundary.

C2—36 to 60 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many fine and few medium interstitial pores; noncalcareous; moderately alkaline (pH 8.4).

The profile is loam, gravelly loam, or clay loam. It is neutral to moderately alkaline. The profile, to a depth of 20 inches, has hue of 7.5YR or 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 1 to 3. Below a depth of 20 inches, it has hue of 7.5YR or 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4.

Some areas of the Manzano soils are subject to rare, very brief periods of flooding during July through September.

Mimbres series

The soils in the Mimbres series are classified as Typic Camborthids, fine-silty, mixed, thermic. These deep, well drained soils formed in silty alluvium derived from mixed sources. They are along intermittent streams, in playas, and on flood plains. Slope is 0 to 1 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Mimbres silty clay loam in an area of Stellar-Verhalen-Mimbres association, 0 to 2 percent slopes; about 20 miles northwest of Hachita; NE1/4NE1/4SW1/4 of sec. 22, T. 24 S., R. 16 W.

A1—0 to 6 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/2) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and plastic; noncalcareous; mildly alkaline (pH 7.4); gradual smooth boundary.

B2—6 to 23 inches; reddish brown (5YR 5/4) silty clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; common fine and very fine tubular pores; noncalcareous; mildly alkaline (pH 7.8); gradual smooth boundary.

C1ca—23 to 60 inches; reddish brown (5YR 5/4) silty clay loam, reddish brown (5YR 4/3) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; few fine tubular pores; slightly calcareous; moderately alkaline (pH 8.0).

The solum is 15 to 40 inches thick.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. It is loam or silty clay loam.

The B and C horizons have hue of 5YR or 7.5YR, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 2 to 4.

The Mimbres soils are subject to rare to frequent, very brief periods of flooding during July through September.

Mohave series

The soils in the Mohave series are classified as Typic Haplargids, fine-loamy, mixed, thermic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on alluvial plains and fans. Slope is 1 to 5 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Mohave sandy clay loam in an area of Stellar-Mohave association, 0 to 5 percent slopes; about 0.1 mile west and 0.8 mile north of the southeast corner of sec. 34, T. 24 S., R. 15 W.

A1—0 to 3 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine and very fine vesicular pores; noncalcareous; neutral (pH 6.6); clear smooth boundary.

B21t—3 to 7 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine pores; thin patchy clay films; noncalcareous; mildly alkaline (pH 7.6); gradual smooth boundary.

B22t—7 to 10 inches; brown (5YR 5/4) sandy clay loam, brown (5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine pores; many thin clay films; slightly calcareous; mildly alkaline (pH 7.8); gradual smooth boundary.

B23tca—10 to 19 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine pores; many thin clay films; common thin lime mycelia; moderately calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

B24tca—19 to 39 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few medium and fine pores; thin patchy clay films; common medium soft lime masses; strongly calcareous; strongly alkaline (pH 8.8); clear smooth boundary.

C1—39 to 54 inches; light brown (7.5YR 6/4) sandy loam; brown (7.5YR 5/4) moist; massive; hard, friable, slightly sticky and nonplastic; few very fine roots; common fine and very fine pores; slightly calcareous; mildly alkaline (pH 7.8); clear smooth boundary.

IIB21tb—54 to 72 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine pores; few thin clay films; few medium soft lime masses; slightly calcareous; moderately alkaline (pH 8.2).

The A horizon has hue of 7.5YR or 10YR, value of 5 to 7 when dry and 3 to 5 when moist, and chroma of 2 to 6.

The B and C horizons have hue of 7.5YR or 5YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 3 to 6. They are loam, sandy clay loam, or clay loam.

Muzzler series

The soils in the Muzzler series are classified as Lithic Argiustolls, clayey-skeletal, mixed, mesic. These shallow, well drained soils formed in residuum derived mainly from acid igneous rock. They are on mountains and hills. Slope is 5 to 65 percent. Elevation is 5,000 to 7,500 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Muzzler cobbly sandy loam in an area of Muzzler-Rock outcrop association, 25 to 45 percent slopes; about 6 miles east of Bayard; NW1/4NE1/4 of sec. 7, T. 18 S., R. 11 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores; 30 percent cobbles; noncalcareous; neutral (pH 6.8); clear smooth boundary.

B21t—2 to 8 inches; very dark grayish brown (10YR 3/2) very cobbly clay, very dark gray (10YR 3/1) moist; strong coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; common very fine tubular pores; thin patchy clay films on faces of peds; 40 percent cobbles; noncalcareous; neutral (pH 7.0); clear wavy boundary.

B22t—8 to 19 inches; dark brown (7.5YR 3/2) very cobbly clay, dark reddish brown (7.5YR 3/2) moist; strong coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; few very fine tubular pores; 50 percent cobbles; neutral (pH 6.8); gradual irregular boundary.

R—19 inches; slightly fractured acid igneous bedrock that has some clay flows in fractures.

The thickness of the solum and depth to bedrock range from 7 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3 when moist and 3 or 4 when dry, and chroma of 2 or 3. It is cobbly sandy loam, cobbly loam, or very cobbly clay loam.

The B horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 1 to 3. It is very cobbly clay loam or very cobbly clay and is 40 to 80 percent coarse fragments.

Nickel series

The soils in the Nickel series are classified as Typic Calciorthids, loamy-skeletal, mixed, thermic. These deep, well drained soils formed in calcareous alluvium derived

from mixed sources. They are on alluvial fans, side slopes, and piedmonts. Slope is 2 to 15 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Nickel gravelly sandy loam in an area of Nickel-Upton association, 2 to 15 percent slopes; about 4 miles southwest of Hachita; NW1/4SE1/4NE1/4 of sec. 17, T. 28 S., R. 15 W.

A1—0 to 6 inches; brown (10YR 5/3) gravelly sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many fine interstitial pores; 20 percent gravel; slightly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

B2—6 to 14 inches; brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common medium and fine roots; common fine tubular pores; 15 percent gravel; moderately calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

B3ca—14 to 19 inches; brown (7.5YR 5/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; many fine interstitial pores; 35 percent gravel; few carbonate nodules; strongly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

C1ca—19 to 35 inches; light brown (7.5YR 6/4) very gravelly silt loam, brown (7.5YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; 45 percent gravel; common carbonate nodules and coatings on peds and gravel; strongly calcareous; moderately alkaline (pH 8.0); gradual smooth boundary.

C2ca—35 to 37 inches; light brown (7.5YR 6/4) very gravelly loamy sand, brown (7.5YR 5/4) moist; massive; very hard, friable, nonsticky and nonplastic; 80 percent gravel; weakly cemented with carbonates; strongly calcareous; moderately alkaline (pH 8.0); abrupt smooth boundary.

C3ca—37 to 44 inches; light brown (7.5YR 6/4) very gravelly loamy sand, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 50 percent gravel; strongly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

C4ca—44 to 60 inches; reddish yellow (7.5YR 6/6) gravelly fine sandy loam, brown (7.5YR 5/4) moist; massive; hard, very friable, nonsticky and nonplastic; moderately calcareous; moderately alkaline (pH 8.2).

The solum is more than 35 percent coarse fragments. Depth to a dense layer of calcium carbonate accumulation is 10 to 25 inches. The profile has hue of 10YR or 7.5YR, value of 4 to 6 when moist and 5 to 7 when dry, and chroma of 2 to 4.

Oro Grande series

The soils in the Oro Grande series are classified as Lithic Haplustolls, loamy-skeletal, mixed, mesic. These shallow, well drained soils formed in residuum derived mainly from dolomitic limestone. They are on mountains and hills. Slope is 5 to 75 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of an Oro Grande very cobbly loam in an area of Oro Grande-Rock outcrop complex, 5 to 15 percent slopes; about 0.9 mile west and 0.4 mile south of the northwest corner of sec. 32, T. 17 S., R. 13 W.

A1—0 to 9 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; soft, friable, slightly sticky and slightly plastic; many fine roots and few medium roots; many fine and very fine interstitial pores; 10 percent gravel and 50 percent cobbles; mildly alkaline (pH 7.5); gradual wavy boundary.

C1—9 to 13 inches; dark brown (7.5YR 4/3) very cobbly loam, dark brown (7.5YR 3/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots and few medium roots; few fine and very fine interstitial pores; 10 percent gravel and 45 percent cobbles; slightly calcareous; moderately alkaline (pH 8.0); abrupt irregular boundary.

R—13 inches; fractured hard dolomitic limestone.

Depth to bedrock is 4 to 20 inches. The profile is 35 to 80 percent rock fragments, dominantly gravel and cobbles.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 3 or 4.

Orthents

The Orthents are shallow to deep soils that formed in old alluvium derived from conglomerate. They are on eroded breaks and ridges. Slope is 25 to 60 percent. Elevation is 4,000 to 7,000 feet. The average annual precipitation is 12 inches. The average annual air temperature is 57 degrees F, and the frost-free season is 150 to 220 days.

Reference pedon of Orthents, 25 to 60 percent slopes; about 1 mile south of Silver City; SW1/4NE1/4SW1/4 of sec. 11, T. 18 S., R. 14 W.

A—0 to 3 inches; grayish brown (10YR 5/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; 20 percent gravel; strongly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

C1ca—3 to 11 inches; light brownish gray (10YR 6/2) gravelly sandy loam, brown (10YR 4/3) moist; strong fine granular structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; 25 percent gravel; very strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

C2ca—11 to 50 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine and very fine roots; few fine interstitial pores; 10 percent gravel; very strongly calcareous; moderately alkaline (pH 8.4); abrupt wavy boundary.

Cr—50 inches; moderately cemented conglomerate.

Depth to bedrock ranges from less than 20 inches to more than 60 inches. These soils are extremely variable in characteristics. They range from very shallow to deep. The profile is 10 to 30 percent clay and 0 to 50 percent rock fragments, mostly gravel. These soils are calcareous and are moderately alkaline or strongly alkaline.

Paymaster series

The soils in the Paymaster series are classified as Cumulic Haplustolls, coarse-loamy, mixed, mesic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on foot slopes, terraces, flood plains, and alluvial fans. Slope is 0 to 15 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Paymaster fine sandy loam in an area of Paymaster-Ellicott complex, 1 to 3 percent slopes; about 9 miles northeast of Santa Rita; SE1/4NW1/4 of sec. 17, T. 16 S., R. 11 W.

A11—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine interstitial pores; mildly alkaline (pH 7.6); clear smooth boundary.

A12—5 to 10 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine interstitial pores; mildly alkaline (pH 7.6); clear smooth boundary.

C1—10 to 29 inches; dark grayish brown (10YR 4/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; mildly alkaline (pH 7.6); clear smooth boundary.

C2—29 to 55 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; mildly alkaline (pH 7.6); abrupt smooth boundary.

C3—55 to 60 inches; dark brown (10YR 5/2) extremely gravelly loamy sand, very dark grayish brown (10YR 3/2) moist; single grained; loose; 80 percent gravel and cobbles; common fine interstitial pores; moderately alkaline (pH 8.0).

The profile averages less than 18 percent clay. The upper 20 to 40 inches has hue of 7.5YR or 10YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3. Gravel content, to a depth of 40 inches, is as much as 5 percent.

Some areas of Paymaster soils are subject to rare, very brief periods of flooding during July through September.

Plack series

The soils in the Plack series are classified as Petrocalcic Calciustolls, loamy, mixed, mesic, shallow. These shallow to indurated caliche, well drained soils formed in residuum derived mainly from conglomerate. They are on broad terrace remnants. Slope is 0 to 8 percent. Elevation is 5,000 to 6,000 feet. The average annual precipitation is 15 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of Plack gravelly loam, 0 to 8 percent slopes; about 4 miles south of Hurley; SE1/4NE1/4 of sec. 25, T. 19 S., R. 13 W.

A11—0 to 2 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine pores; very strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

A12—2 to 9 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; common very fine pores; very strongly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

A13—9 to 17 inches; light brownish gray (10YR 6/2) heavy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine pores; very strongly calcareous; moderately alkaline (pH 8.4); abrupt wavy boundary.

Ccam—17 inches; indurated caliche.

Thickness of the solum and depth to indurated caliche are 8 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry, and chroma of 2 or 3.

The B horizon, where present, has hue of 7.5YR or 10YR, value of 3 to 6 when dry and 3 or 4 when moist, and chroma of 2 or 3.

The C horizon is strongly cemented to weakly cemented throughout.

Plack Variant

The Plack Variant soils are classified as Lithic Calciustolls, loamy, mixed, mesic. These shallow, well drained soils formed in residuum derived mainly from conglomerate. They are on ridges. Slope is 1 to 35 percent. Elevation is 5,000 to 6,500 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Plack Variant gravelly loam in an area of Plack Variant-Guy complex, 1 to 8 percent slopes; about 1 mile southwest of Silver City; NW1/4SW1/4NW1/4 of sec. 15, T. 18 S., R. 14 W.

A1—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots and few medium roots; many fine interstitial pores; 30 percent gravel; strongly calcareous; moderately alkaline (pH 8.4); clear irregular boundary.

Cca—5 to 11 inches; light gray (10YR 7/2) gravelly silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and plastic; common fine roots and few medium roots; many very fine interstitial pores; 15 percent gravel; very strongly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

R—11 to 60 inches; strongly cemented conglomerate.

Depth to strongly cemented conglomerate is 6 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry, and chroma of 1 to 3. It is slightly calcareous to strongly calcareous.

The Cca horizon has hue of 10YR or 7.5YR, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 2 to 4. It is gravelly silt loam, gravelly sandy loam, gravelly loam, or gravelly clay loam. The horizon is strongly calcareous or very strongly calcareous.

Ruidoso series

The soils in the Ruidoso series are classified as Pachic Argiustolls, fine, mixed, mesic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on hillsides, terraces, and alluvial fans and in valleys. Slope is 0 to 8 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Ruidoso clay loam in an area of Gaddes-Ruidoso complex, 3 to 15 percent slopes; about 0.5 mile south of the northwest corner of sec. 9, T. 18 S., R. 13 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; few fine, medium, and coarse roots; common very fine and fine pores; noncalcareous; mildly alkaline (pH 7.8); clear smooth boundary.

B21t—3 to 24 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong coarse and medium angular blocky structure; very hard, sticky and plastic; common fine roots and few medium and coarse roots; few very fine and fine pores; thin continuous clay films on faces of peds; noncalcareous; mildly alkaline (pH 7.8) decreasing to neutral (pH 6.8) below a depth of 10 inches; gradual smooth boundary.

B22t—24 to 31 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky; very hard, firm, sticky and plastic; few fine and medium roots; few very fine and fine pores; thin continuous clay films on faces of peds; slightly calcareous in a few small pockets; mildly alkaline (pH 7.8); diffuse smooth boundary.

B23t—31 to 50 inches; pale brown (10YR 5/3) clay, brown (10YR 4/4) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky; very hard, firm, sticky and plastic; few fine and medium roots; few very fine and fine pores; thin continuous clay films on faces of peds; noncalcareous; mildly alkaline (pH 7.8); gradual smooth boundary.

B3tca—50 to 60 inches; yellowish brown (10YR 5/4) sandy clay, dark yellowish brown (10YR 4/4) moist; common large distinct strong brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; few very fine and fine pores; slightly calcareous; moderately alkaline (pH 8.0).

The solum is more than 40 inches thick.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 1 to 3.

The B horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4. It is clay, sandy clay, or heavy clay loam.

The Ruidoso soils in map unit 73 are a taxadjunct to the Ruidoso series because they are about 2 degrees F warmer than the range of the series.

Sampson series

The soils in the Sampson series are classified as Pachic Argiustolls, fine-loamy, mixed, mesic. These deep, well drained soils formed in alluvium derived mainly from igneous parent material. They are on intraridge valley bottoms and sides. Slope is 3 to 9 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 15 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Sampson loamy sand in an area of Sampson-Dagflat complex, 3 to 12 percent slopes; about 1 mile southeast of Central; NW1/4SW1/4 of sec. 1, T. 18 S., R. 13 W.

A11—0 to 1 inch; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; many very fine and fine roots; many fine and very fine interstitial pores; noncalcareous; neutral (pH 6.8); clear smooth boundary.

A12—1 inch to 3 inches; dark grayish brown (10YR 4/2) light sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; noncalcareous; neutral (pH 7.0); clear smooth boundary.

B21t—3 to 25 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; many very fine pores; noncalcareous; slightly alkaline (pH 7.2); diffuse smooth boundary.

B22t—25 to 35 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots; many very fine pores; noncalcareous; slightly alkaline (pH 7.6); clear smooth boundary.

B3ca—35 to 45 inches; grayish brown (10YR 5/2) light sandy clay loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots; many very fine pores; slightly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

IIB2tb—45 to 60 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine pores; slightly calcareous; slightly alkaline (pH 7.6); clear smooth boundary.

C1—60 to 66 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, sticky and plastic; common very fine pores; slightly calcareous; slightly alkaline (pH 7.6).

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3.

The B and C horizons are mildly alkaline or moderately alkaline and are sandy clay loam or loam.

Sanloren series

The soils in the Sanloren series are classified as Pachic Argiustolls, clayey-skeletal, mixed, mesic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on old terrace remnants and ridges. Slope is 1 to 10 percent. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 14 inches. The average annual air temperature is 51 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Sanloren loam in an area of Sanloren-Majada Variant complex, 1 to 15 percent slopes; SW1/4NE1/4SE1/4 of sec. 4, T. 17 S., R. 11 W.

A11—0 to 2 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; noncalcareous; neutral (pH 7.0); clear smooth boundary.

A12—2 to 10 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; noncalcareous; mildly alkaline (pH 7.4); clear smooth boundary.

B21t—10 to 20 inches; brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; strong medium subangular blocky structure; hard, friable, sticky and plastic; 10 percent gravel; many very fine roots; common very fine tubular and interstitial pores; thin patchy clay films on faces of peds; noncalcareous; mildly alkaline (pH 7.4); clear wavy boundary.

B22t—20 to 37 inches; brown (7.5YR 4/2) very cobbly clay, dark brown (7.5YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine roots; many very fine interstitial and tubular pores; thin patchy clay films on faces of peds; 60 percent cobbles; noncalcareous; mildly alkaline (pH 7.4); gradual wavy boundary.

C1—37 to 60 inches; brown (7.5YR 4/4) very cobbly sandy clay loam, dark brown (7.5YR 3/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores; 60 percent cobbles; slightly calcareous; mildly alkaline (pH 7.6).

Depth to the argillic horizon ranges from 6 to 16 inches, and depth to carbonates ranges from 20 to 37 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 3 to 5 when dry and 3 or 4 when moist, and chroma of 2 or 3. It is very cobbly clay, very cobbly heavy clay loam, and heavy clay loam. It averages more than 35 percent coarse fragments.

The C horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 or 4. It is very cobbly sandy loam, very cobbly sandy clay loam, very gravelly sandy clay, or gravelly clay loam.

Santa Fe series

The soils in the Santa Fe series are classified as Lithic Argiustolls, loamy-skeletal, mixed, mesic. These shallow, well drained soils formed in residuum derived mainly from acid igneous rock. They are on mountains, ridges, valley sides, and hills. Slope is 5 to 70 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 52 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Santa Fe gravelly sandy loam in an area of Santa Fe-Rock outcrop complex, 5 to 15 percent slopes; about 3 miles east of Silver City; SE1/4NW1/4SE1/4 of sec. 31, T. 17 S., R. 13 W.

A1—0 to 2 inches; dark brown (7.5YR 4/2) gravelly sandy loam, dark brown (7.5YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine interstitial pores; 20 percent gravel; slightly acid (pH 6.4); abrupt wavy boundary.

B2t—2 to 5 inches; dark brown (7.5YR 4/2) very gravelly clay loam, dark brown (7.5YR 3/3) moist; medium fine angular blocky structure; slightly hard, very friable, sticky and plastic; common very fine and fine roots; common very fine interstitial and tubular pores; common moderately thick clay films on faces of peds and in pores; 45 percent gravel; neutral (pH 6.6); clear smooth boundary.

B3t—5 to 18 inches; highly fractured acid igneous bedrock with soil material in cracks; soil material is dark brown (7.5YR 4/2) very gravelly clay loam, dark brown (7.5YR 3/3) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; common moderately thick clay flows in cracks; neutral (pH 6.8); abrupt wavy boundary.

R—18 inches; acid igneous rock.

Thickness of the solum and depth to rock are 8 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. It is 15 to 35 percent coarse fragments.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry, and chroma of 2 or 3. It averages more than 35 percent coarse fragments and is very gravelly loam or very gravelly clay loam.

Santana series

The soils in the Santana series are classified as Lithic Haplustolls, loamy, mixed, mesic. These shallow, well drained soils formed in residuum derived mainly from coarse granite. They are on ridges and hills. Slope is 1 to 35 percent. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of a Santana loam in an area of Santana-Rock outcrop complex, 1 to 25 percent slopes; about 1 mile north of Central; NW1/4NW1/4SW1/4 of sec. 25, T. 17 S., R. 13 W.

A11—0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine interstitial pores; noncalcareous; neutral (pH 6.8); clear smooth boundary.

A12—2 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine and few medium interstitial pores; slightly calcareous; mildly alkaline (pH 7.4); gradual smooth boundary.

C1—8 to 12 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; common fine and few medium interstitial pores; slightly calcareous; mildly alkaline (pH 7.4); abrupt smooth boundary.

R—12 inches; acid igneous bedrock.

Depth to bedrock is 4 to 18 inches. The upper 3 or 4 inches of the bedrock is partially weathered. The profile has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. The A horizon is loam, sandy loam, or loamy sand. The C horizon is gravelly loam, loam, or sandy clay loam. It is 15 to 30 percent clay.

Sonoita series

The soils in the Sonoita series are classified as Typic Haplargids, coarse-loamy, mixed, thermic. These deep, well drained soils formed in coarse textured alluvium derived from mixed sources. They are on alluvial fans and plains. Slope is 1 to 8 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Sonoita loamy sand in an area of Bucklebar-Sonoita-Continental association, 1 to 8 percent slopes; about 19 miles northwest of Hachita; SW1/4SE1/4SW1/4 of sec. 22, T. 24 S., R. 16 W.

A1—0 to 4 inches; brown (7.5YR 5/4) loamy sand, dark brown (7.5YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and slightly plastic; common fine roots; many fine interstitial pores; 5 percent fine gravel; noncalcareous; neutral (pH 6.8); clear smooth boundary.

B21t—4 to 10 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; many fine interstitial pores; 5 percent gravel; noncalcareous; neutral (pH 7.0); clear smooth boundary.

B22t—10 to 45 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; common fine pores; few thin clay films on pebbles and common bridges between sand grains; 10 percent gravel; noncalcareous; neutral (pH 7.2); clear smooth boundary.

C1—45 to 60 inches; light brown (7.5YR 6/4) gravelly loamy sand, brown (7.5YR 4/4) moist; single grained; loose; many fine interstitial pores; 15 percent gravel; slightly calcareous; mildly alkaline (pH 7.8).

The solum is more than 40 inches thick. In some pedons, lime is at a depth of 17 inches, but the calcium carbonate equivalent is less than 15 percent to a depth of 40 inches or more.

The A horizon has hue of 5YR to 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 3 to 6.

The B horizon has hue of 5YR or 7.5YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 3 to 6. It averages sandy loam but has thin strata of sandy clay loam or loam.

Stellar series

The soils in the Stellar series are classified as Ustollic Haplargids, fine, mixed, thermic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on alluvial plains and fans and in depressional areas and drainageways. Slope is 0 to 2 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Stellar sandy clay loam in an area of Stellar-Mohave association, 0 to 5 percent slopes; about 28 miles northwest of Hachita; in the northeast corner of sec. 18, T. 24 S., R. 16 W.

A1—0 to 8 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; few fine and medium roots; many fine and medium interstitial pores; mildly alkaline (pH 7.6); clear smooth boundary.

B1t—8 to 13 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and medium roots; common fine tubular pores and common medium interstitial pores; common thin clay films on faces of peds and in pores; mildly alkaline (pH 7.8); clear smooth boundary.

B21t—13 to 19 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; strong medium subangular blocky structure; hard, firm, sticky and plastic; common fine and medium interstitial pores; few very fine and fine roots; many thin clay films on faces of peds and in pores; moderately alkaline (pH 8.2); abrupt smooth boundary.

B22t—19 to 24 inches; reddish brown (5YR 5/4) clay loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and medium interstitial pores; many thin clay films on faces of peds and in pores; moderately alkaline (pH 8.2); abrupt smooth boundary.

B23tcab—24 to 35 inches; reddish brown (5YR 5/4) clay, yellowish red (5YR 5/6) moist; strong medium subangular blocky structure; hard, firm, sticky and plastic; common fine and medium interstitial pores; many thin clay films on faces of peds and in pores; slightly calcareous; moderately alkaline (pH 8.2); gradual smooth boundary.

C1ca—35 to 60 inches; pink (7.5YR 7/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, firm, nonsticky and nonplastic; common fine and medium interstitial pores; strongly calcareous; moderately alkaline (pH 8.4); gradual smooth boundary.

Thickness of the solum and depth to the Cca horizon or buried B horizon, where present, range from 20 to 40 inches.

The A horizon has hue of 5YR to 10YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 6. It is sandy clay loam or silty clay loam.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 3 to 6. It averages 35 to 50 percent clay in the upper 20 inches.

Stirk Variant

The Stirk Variant soils are classified as Vertic Ustifluvents, fine, montmorillonitic (calcareous), mesic. These deep, moderately well drained soils formed in fine textured alluvium derived from mixed sources. They are on flood plains and alluvial fans. Slope is 0 to 1 percent. Elevation is 5,000 to 6,500 feet. The average annual precipitation is 14 inches. The average annual air temperature is 51 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of Stirk Variant silty clay loam, 0 to 1 percent slopes; NW1/4NW1/4 of sec. 33, T. 14 S., R. 18 W.

A1—0 to 2 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many fine tubular pores; strongly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

C1—2 to 7 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, sticky and plastic; common very fine and fine roots; common very fine tubular pores; strongly calcareous; strongly alkaline (pH 8.6); clear smooth boundary.

C2—7 to 60 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, sticky and plastic; strongly calcareous; strongly alkaline (pH 8.8).

The profile has hue of 7.5YR or 10YR, value of 6 or 7 when dry and 3 or 4 when moist, and chroma of 2 or 3. The C horizon is silty clay or clay. The Stirk Variant soils are subject to rare, very brief periods of flooding during July through September.

Tesajo series

The soils in the Tesajo series are classified as Cumulic Haplustolls, loamy-skeletal, mixed, mesic. These deep, well drained soils formed in alluvium derived from mixed sources. They are on alluvial fans, flood plains, and foot slopes. Slope is 1 to 15 percent. Elevation is 5,000 to 6,500 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Typical pedon of Tesajo very gravelly loam, 8 to 15 percent slopes; in south half of sec. 14, T. 17 S., R. 11 W.

A1—0 to 3 inches; brown (10YR 5/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine pores; 40 percent gravel; noncalcareous; neutral (pH 7.0); clear wavy boundary.

B2—3 to 24 inches; brown (10YR 4/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine pores; 50 percent gravel; noncalcareous; mildly alkaline (pH 7.4); gradual wavy boundary.

C1—24 to 60 inches; brown (7.5YR 5/4) very gravelly heavy loam, brown (7.5YR 4/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine pores; 55 percent gravel; noncalcareous; mildly alkaline (pH 7.4).

Depth to bedrock is 60 inches or more. The mollic epipedon is 20 to 28 inches thick.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 to 4. It is very gravelly loam or gravelly sandy loam.

The B and C horizons have hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. They are very gravelly loam or very cobbly sandy clay loam.

Some areas of the Tesajo soils are subject to rare, very brief periods of flooding during July through September.

Tres Hermanos series

The soils in the Tres Hermanos series are classified as Typic Haplargids, fine-loamy, mixed, thermic. These deep, well drained soils formed in calcareous alluvium derived from mixed sources. They are on the sides of piedmonts and on terraces, alluvial fans, and foot slopes. Slope is 0 to 8 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Tres Hermanos gravelly sandy clay loam in an area of Tres Hermanos-Lehmans association, 1 to 15 percent slopes; about 24 miles southwest of Buckhorn, SE1/4NE1/4SE1/4 of sec. 20, T. 17 S., R. 21 W.

A1—0 to 3 inches; reddish brown (5YR 5/3) gravelly sandy clay loam, dark reddish brown (5YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; many fine interstitial pores; strongly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

B21t—3 to 6 inches; reddish brown (5YR 5/3) clay loam, reddish brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many fine roots; many fine tubular pores; strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

B22tca—6 to 13 inches; reddish brown (7.5YR 5/4) gravelly clay loam, reddish brown (7.5YR 4/4) moist; moderate fine angular blocky structure; hard, friable, sticky and plastic; many fine roots; common fine tubular pores; very strongly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

Cca—13 to 60 inches; pink (5YR 8/3) gravelly sandy loam, light reddish brown (5YR 6/3) moist; massive; very hard, friable, nonsticky and nonplastic; very strongly calcareous; moderately alkaline (pH 8.4).

The control section is 15 to 30 percent coarse fragments.

The A horizon has hue of 5YR or 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 2 to 4. It is gravelly sandy clay loam or fine sandy loam.

The B horizon has hue of 5YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4. It is gravelly clay loam, gravelly sandy clay loam, or clay loam.

The C horizon has hue of 5YR or 7.5YR, and it has value of 7 or 8 when dry and 5 or 6 when moist. It is gravelly sandy loam or gravelly sandy clay loam.

Upton series

The soils in the Upton series are classified as Typic Paleorthids, loamy, carbonatic, thermic, shallow. These shallow to indurated caliche, well drained soils formed in calcareous alluvium derived from mixed sources. They are on foot slopes, alluvial fans, and terrace remnants. Slope is 0 to 5 percent. Elevation is 4,000 to 5,500 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of an Upton gravelly loam in an area of Tres Hermanos-Upton complex, 0 to 5 percent slopes; about 12 miles north of Hachita; NE1/4NE1/4SW1/4 of sec. 31, T. 25 S., R. 14 W.

A—0 to 3 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine and fine vesicular pores; slightly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

B21—3 to 6 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine pores; moderately calcareous; moderately alkaline (pH 8.4); gradual smooth boundary.

B22—6 to 12 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine pores; moderately calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

C1ca—12 to 14 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; very few very fine and fine roots; common very fine and fine pores; very strongly calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

C2cam—14 to 20 inches; white (10YR 8/2) indurated caliche.

C3ca—20 to 36 inches; white (10YR 8/2) gravelly silt loam, very pale brown (10YR 7/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine pores; very strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

Depth to indurated caliche ranges from 7 to 20 inches. The A horizon has hue of 10YR or 7.5YR, and it has value of 5 or 6 when dry.

The B horizon has hue of 10YR or 7.5YR.

Some pedons do not have a thin C1 horizon.

Ustorthents

Ustorthents are moderately deep and deep soils that formed in old alluvium derived mainly from conglomerate. They are on ridges, hills, and breaks. Slope is 10 to 60 percent. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 14 inches. The average annual air temperature is 54 degrees F, and the frost-free season is 150 to 180 days.

Reference pedon of Ustorthents in an area of Lonti-Ustorthents association, 5 to 60 percent slopes; about 4 miles northwest of Gila; NE1/4NE1/4NE1/4 of sec. 2, T. 15 S., R. 17 W.

A—0 to 3 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine interstitial pores; 40 percent gravel; moderately calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

C1ca—3 to 60 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few fine interstitial pores; 45 percent gravel; moderately calcareous (pH 8.4).

Depth to conglomerate is more than 20 inches. These soils are extremely variable in characteristics. They are moderately deep to deep. The soils are 5 to 45 percent clay and 5 to 50 percent rock fragments. They are moderately alkaline or strongly alkaline.

Verhalen series

The soils in the Verhalen series are classified as Mollic Torrerts, fine, montmorillonitic, thermic. These deep, moderately well drained soils formed in calcareous, fine textured alluvium and lacustrine sediment derived from mixed sources. They are in bolsons and on valley bottoms and basin floors. Slope is 0 to 1 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 10 inches. The average annual air temperature is 60 degrees F, and the frost-free season is 180 to 220 days.

Typical pedon of a Verhalen silty clay in an area of Hondale-Verhalen association, 0 to 3 percent slopes; about 3 miles southwest of Hachita; SE1/4SE1/4SE1/4 of sec. 10, T. 28 S., R. 15 W.

A1—0 to 10 inches; pinkish gray (7.5YR 6/2) silty clay, brown (7.5YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, sticky and plastic; many medium roots; many fine tubular pores; strongly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1—10 to 60 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/3) moist; strong coarse angular blocky structure; hard, friable, sticky and plastic; few fine roots; many very fine tubular pores; strongly calcareous; moderately alkaline (pH 8.4).

The profile has hue of 5YR to 10YR, value of 4 to 6 when dry and 2 to 4 when moist, and chroma of 2 to 4. It ranges from heavy silty clay loam or heavy clay loam to silty clay or clay. In some pedons, the upper 12 inches is noncalcareous.

The Verhalen soils are subject to rare, very brief periods of flooding during July through September.

White House series

The soils in the White House series are classified as Ustollic Haplargids, fine, mixed, thermic. These deep, well drained soils formed in old alluvium derived from conglomerate. They are on the sides of pediments. Slope is 1 to 8 percent. Elevation is 4,800 to 5,500 feet. The average annual precipitation is 12 inches. The average annual air temperature is 58 degrees F, and the frost-free season is 180 to 200 days.

Typical pedon of a White House sandy clay loam in an area of White House-Ruidoso association, 0 to 8 percent slopes; about 11 miles south of Hurley; NW1/4NW1/4 of sec. 24, T. 20 S., R. 13 W.

A1—0 to 3 inches; strong brown (7.5YR 5/6) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak moderate granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many fine interstitial pores; slightly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

B2t—3 to 14 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; strong moderate prismatic structure parting to strong moderate subangular blocky; hard, firm, sticky and plastic; common fine and medium roots; many fine interstitial pores; many thin clay films on faces of peds, in pores, and as bridges between mineral grains; strongly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

B3t—14 to 20 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common medium interstitial pores; few thin clay films on faces of peds and in pores; strongly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

C1—20 to 25 inches; yellowish red (5YR 5/8) very gravelly sandy clay loam, yellowish red (5YR 4/8) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common medium interstitial pores; strongly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

B21tb—25 to 36 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; strong moderate subangular blocky structure; hard, firm, sticky and plastic; common medium interstitial pores; many thin clay films on faces of peds, in pores, and as bridges between mineral grains; strongly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

B22tb—36 to 41 inches; yellowish red (5YR 5/8) gravelly sandy clay, yellowish red (5YR 5/6) moist; weak moderate subangular blocky structure; slightly hard, friable, sticky and plastic; common medium interstitial pores; common thin clay films on faces of peds, in pores, and as bridges between mineral grains; slightly calcareous; moderately alkaline (pH 8.0); clear smooth boundary.

C1b—41 to 60 inches; yellowish red (5YR 5/8) sandy clay, yellowish red (5YR 4/8) moist; massive; slightly hard, friable, sticky and plastic; common medium interstitial pores; noncalcareous; moderately alkaline (pH 8.2).

The solum is 20 to 30 inches thick. It is 0 to 30 percent coarse fragments and is neutral to moderately alkaline. Bedrock is at a depth of 60 inches or more.

The A horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 to 6.

The B horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 to 6. It is sandy clay or clay.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1931-60 at Fort Bayard, N. Mex.]

Month	Temperature		Precipitation	
	Average daily maximum	Average daily minimum	Monthly average	Average number of days with 0.10 inch or more precipitation
	°F	°F	In	
January	52	25	0.85	3
February	55	27	0.96	2
March	60	31	0.75	3
April	69	37	0.38	1
May	77	44	0.39	1
June	87	54	0.73	1
July	86	58	3.10	7
August	85	57	3.34	8
September	80	52	2.02	2
October	71	42	1.15	4
November	60	31	0.71	1
December	53	26	0.90	2
Year	70	40	15.28	35

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Abrazo-Luzena complex, 3 to 15 percent slopes	10,684	0.6
2	Abrazo-Luzena complex, 15 to 45 percent slopes	4,151	0.2
3	Anthony fine sandy loam, 1 to 3 percent slopes	1,627	0.1
4	Boysag clay loam, 15 to 35 percent slopes	3,136	0.2
5	Boysag-Abrazo-Santana complex, 3 to 20 percent slopes	35,109	2.1
6	Bucklebar-Sonoita-Continental association, 1 to 8 percent slopes	85,956	5.1
7	Carnero-Santa Fe complex, 5 to 15 percent slopes	4,542	0.3
8	Conger gravelly loam, 0 to 5 percent slopes	9,539	0.6
9	Conger-Stellar association, 0 to 5 percent slopes	10,944	0.6
10	Continental-Nickel association, 0 to 15 percent slopes	9,252	0.5
11	Dagflat-Santa Fe complex, 1 to 25 percent slopes	4,008	0.2
12	Encierro-Rock outcrop complex, 8 to 30 percent slopes	14,327	0.8
13	Encierro-Rock outcrop complex, 15 to 35 percent slopes	4,997	0.3
14	Gaddes-Ruidoso complex, 3 to 15 percent slopes	703	*
15	Gaddes-Santa Fe-Rock outcrop complex, 15 to 45 percent slopes	5,661	0.3
16	Gila Variant fine sandy loam, 1 to 3 percent slopes	1,028	*
17	Guy very cobbly loam, 15 to 35 percent slopes	9,500	0.6
18	Guy-Lonti complex, 3 to 15 percent slopes	9,330	0.6
19	Haverson silty clay loam, 0 to 1 percent slopes	1,835	0.1
20	Hondale-Verhalen association, 0 to 3 percent slopes	14,406	0.8
21	Jonale sandy clay loam, 15 to 35 percent slopes	19,129	1.1
22	Judd-Manzano association, 1 to 15 percent slopes	17,073	1.0
23	Lehmans-Lithic Haplargids complex, 5 to 15 percent slopes	17,164	1.0
24	Lithic Haplargids-Rock outcrop association, 15 to 75 percent slopes	57,726	3.4
25	Lonti gravelly loam, 15 to 35 percent slopes	45,051	2.7
26	Lonti gravelly clay loam, 0 to 8 percent slopes	17,359	1.0
27	Lonti-Denver Variant complex, 1 to 25 percent slopes	969	*
28	Lonti-Manzano association, 1 to 25 percent slopes	107,246	6.4
29	Lonti-Ustorthents association, 5 to 60 percent slopes	84,537	5.0
30	Luzena very gravelly sandy clay loam, 5 to 25 percent slopes	11,868	0.7
31	Luzena-Rock outcrop association, 10 to 35 percent slopes	142,784	8.5
32	Manzano loam, 0 to 1 percent slopes	1,770	0.1
33	Manzano loam, 1 to 3 percent slopes	11,173	0.7
34	Manzano-Ruidoso association, 0 to 5 percent slopes	13,195	0.8
35	Mimbres-Arizo-Riverwash association, 0 to 5 percent slopes	12,896	0.8
36	Muzzler very cobbly clay loam, 15 to 35 percent slopes	10,671	0.6
37	Muzzler-Rock outcrop association, 25 to 45 percent slopes	108,076	6.4
38	Nickel-Upton association, 2 to 15 percent slopes	58,182	3.5
39	Oro Grande-Rock outcrop complex, 5 to 15 percent slopes	4,034	0.2
40	Oro Grande-Rock outcrop complex, 25 to 75 percent slopes	7,522	0.5
41	Orthents, 25 to 60 percent slopes	32,325	1.9
42	Paymaster gravelly sandy loam, 3 to 15 percent slopes	781	*
43	Paymaster-Ellicott complex, 0 to 1 percent slopes	4,125	0.2
44	Paymaster-Ellicott complex, 1 to 3 percent slopes	7,509	0.5
45	Paymaster-Ellicott-Manzano association, 0 to 5 percent slopes	11,009	0.7
46	Pits-Dumps association, extremely steep	13,195	0.8
47	Plack gravelly loam, 0 to 8 percent slopes	16,214	1.0
48	Plack Variant-Guy complex, 1 to 8 percent slopes	481	*
49	Plack Variant-Guy complex, 15 to 35 percent slopes	1,158	*
50	Riverwash	2,577	0.2
51	Rock outcrop-Graham association, 5 to 25 percent slopes	19,377	1.2
52	Rock outcrop-Lithic Ustorthents complex, 15 to 65 percent slopes	28,928	1.7
53	Rock outcrop-Luzena association, 25 to 60 percent slopes	76,821	4.6
54	Rock outcrop-Muzzler association, 25 to 65 percent slopes	43,399	2.6
55	Ruidoso clay loam, 3 to 5 percent slopes	3,774	0.2
56	Ruidoso-Muzzler association, 5 to 15 percent slopes	17,047	1.0
57	Sampson-Dagflat complex, 3 to 12 percent slopes	2,668	0.2
58	Sanloren-Majada Variant complex, 1 to 15 percent slopes	3,266	0.2
59	Santa Fe-Rock outcrop complex, 5 to 15 percent slopes	8,289	0.5
60	Santa Fe-Rock outcrop complex, 20 to 45 percent slopes	24,959	1.5
61	Santa Fe, dry-Rock outcrop complex, 25 to 70 percent slopes	11,452	0.7
62	Santana loamy sand, 15 to 25 percent slopes	1,575	0.1
63	Santana-Rock outcrop complex, 1 to 25 percent slopes	10,111	0.6
64	Santana-Rock outcrop complex, 15 to 35 percent slopes	44,192	2.6
65	Stellar-Mohave association, 0 to 5 percent slopes	149,824	8.9
66	Stellar-Verhalen-Mimbres association, 0 to 2 percent slopes	34,862	2.1
67	Stirk Variant silty clay loam, 0 to 1 percent slopes	846	0.1
68	Tesajo very gravelly loam, 8 to 15 percent slopes	638	*
69	Tesajo-Manzano complex, 1 to 3 percent slopes	625	*
70	Tres Hermanos gravelly sandy clay loam, 0 to 8 percent slopes	30,373	1.8

See footnote at end of table.

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
71	Tres Hermanos-Lehmans association, 1 to 15 percent slopes	10,866	0.6
72	Tres Hermanos-Upton complex, 0 to 5 percent slopes	61,981	3.7
73	White House-Ruidoso association, 0 to 8 percent slopes	22,955	1.4
	Water	100	*
	Total	1,687,467	100.0

* Less than 0.1 percent.

TABLE 3.--YIELDS PER ACRE OF IRRIGATED CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only the soils suited to crops are listed]

Soil name and map symbol	Alfalfa hay	Barley	Sorghum silage	Apples	Pasture	Wheat
	Ton	Bu	Ton	Bu	AUM*	Bu
3---------- Anthony	6.0	60	---	---	12	---
16---------- Gila Variant	7.0	75	---	---	13	80
26---------- Lonti	3.5	70	---	---	9	40
32, 33---------- Manzano	4	80	---	---	7	50
43, 44:						
Paymaster----------	4	80	---	7	7	50
Ellicott----------	4	75	---	6	6	40
55---------- Ruidoso	3.5	75	---	6	6	45
58---------- Sanloren-Majada Variant	---	---	---	---	6	---
67---------- Stirk Variant	5.0	70	---	---	9	70
69:						
Tesajo----------	3	60	---	---	6	40
Manzano----------	4	80	---	---	7	50

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 4.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1*:				
Abrazo	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight.
Luzena	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, depth to rock.	Moderate: large stones.
2*:				
Abrazo	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: slope.
Luzena	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
3--- Anthony	Severe: floods.	Slight	Moderate: slope.	Slight.
4--- Boysag	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
5*:				
Boysag	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.
Abrazo	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight.
Santana	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.
6*:				
Bucklebar	Slight	Slight	Moderate: slope.	Slight.
Sonoita	Slight	Slight	Moderate: slope.	Slight.
Continental	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
7*:				
Carnero	Slight	Slight	Severe: slope.	Slight.
Santa Fe	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.
8--- Conger	Severe: cemented pan.	Severe: cemented pan.	Severe: small stones, cemented pan.	Slight.

See footnote at end of table.

TABLE 4.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
9*:				
Conger	Severe: cemented pan.	Severe: cemented pan.	Severe: small stones, cemented pan.	Slight.
Stellar	Slight	Slight	Slight	Slight.
10*:				
Continental	Moderate: percs slowly.	Moderate: percs slowly.	Severe: percs slowly.	Slight.
Nickel	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
11*:				
Dagflat	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.
Santa Fe	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
12*:				
Encierro	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
Rock outcrop.				
13*:				
Encierro	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
14*:				
Gaddes	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Ruidoso	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
15*:				
Gaddes	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Santa Fe	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
16--- Gila Variant	Severe: floods.	Slight	Moderate: slope, floods.	Slight.
17--- Guy	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: large stones, slope.

See footnote at end of table.

TABLE 4.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
18*:				
Guy	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: dusty.
Lonti	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
19--- Haverson	Severe: floods.	Slight	Slight	Slight.
20*:				
Hondale	Severe: floods.	Severe: percs slowly.	Severe: percs slowly.	Slight.
Verhalen	Severe: floods.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
21--- Jonale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
22*:				
Judd	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.
Manzano	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
23*:				
Lehmans	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Slight.
Lithic Haplargids.				
24*:				
Lithic Haplargids.				
Rock outcrop.				
25--- Lonti	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
26--- Lonti	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight.
27*:				
Lonti	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: dusty.
Denver Variant	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.
28*:				
Lonti	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: dusty.
Manzano	Severe: floods.	Slight	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 4.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
29*:				
Lonti	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.
Ustorthents.				
30	Severe:	Severe:	Severe:	Severe:
Luzena	slope, small stones, depth to rock.	slope, small stones, depth to rock.	slope, small stones, depth to rock.	small stones.
31*:				
Luzena	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.
Rock outcrop.				
32	Severe:	Slight	Slight	Slight.
Manzano	floods.			
33	Severe:	Slight	Moderate:	Slight.
Manzano	floods.		slope.	
34*:				
Manzano	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: slope, percs slowly, dusty.	Moderate: dusty.
Ruidoso	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
35*:				
Mimbres	Severe: floods.	Moderate: floods, dusty.	Severe: floods.	Severe: erodes easily.
Arizo	Severe: floods.	Moderate: floods.	Moderate: slope, small stones.	Moderate: floods.
Riverwash.				
36	Severe:	Severe:	Severe:	Severe:
Muzzler	slope, large stones, depth to rock.	slope, large stones, depth to rock.	large stones, slope, depth to rock.	large stones, slope.
37*:				
Muzzler	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope.
Rock outcrop.				
38*:				
Nickel	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
Upton	Severe: cemented pan.	Severe: cemented pan.	Severe: small stones, cemented pan.	Moderate: dusty.

See footnote at end of table.

TABLE 4.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
39*:				
Oro Grande	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, small stones.	Severe: large stones.
Rock outcrop.				
40*:				
Oro Grande	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, small stones.	Severe: large stones, slope.
Rock outcrop.				
41*.				
Orthents				
42 Paymaster	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
43*:				
Paymaster	Severe: floods.	Slight	Slight	Slight.
Ellicott	Severe: floods, too sandy.	Severe: too sandy.	Severe: small stones, floods.	Severe: too sandy.
44*:				
Paymaster	Severe: floods.	Slight	Moderate: slope.	Slight.
Ellicott	Severe: floods, too sandy.	Severe: too sandy.	Severe: small stones, floods.	Severe: too sandy.
45*:				
Paymaster	Severe: floods.	Slight	Moderate: slope.	Slight.
Ellicott	Severe: floods, too sandy.	Severe: too sandy.	Severe: small stones, floods.	Severe: too sandy.
Manzano	Severe: floods.	Slight	Slight	Slight.
46*:				
Pits.				
Dumps.				
47 Plack	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight.
48*:				
Plack Variant	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones, depth to rock.	Slight.
Guy	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: dusty.

See footnote at end of table.

TABLE 4.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
49*:				
Plack Variant	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
Guy	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: slope.
50*. Riverwash				
51*: Rock outcrop.				
Graham	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
52*: Rock outcrop. Lithic Ustorthents.				
53*: Rock outcrop.				
Luzena	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
54*: Rock outcrop.				
Muzzler	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope.
55--- Ruidoso	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
56*:				
Ruidoso	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight.
Muzzler	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, depth to rock.	Moderate: large stones.
57*:				
Sampson	Slight	Slight	Severe: slope.	Slight.
Dagflat	Slight	Slight	Severe: slope.	Severe: erodes easily.
58*:				
Sanloren	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.

See footnote at end of table.

TABLE 4.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
58*:				
Majada Variant	Moderate: slope, large stones, percs slowly.	Moderate: slope, large stones, percs slowly.	Severe: large stones, slope.	Moderate: large stones.
59*:				
Santa Fe	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.
Rock outcrop.				
60*, 61*:				
Santa Fe	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
62 Santana	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
63*:				
Santana	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
Rock outcrop.				
64*:				
Santana	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
65*:				
Stellar	Slight	Slight	Slight	Slight.
Mohave	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
66*:				
Stellar	Slight	Slight	Slight	Slight.
Verhalen	Severe: floods.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
Mimbres	Severe: floods, excess salt.	Severe: excess salt.	Severe: excess salt.	Severe: erodes easily.
67 Stirk Variant	Severe: floods, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight.
68 Tesajo	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
69*:				
Tesajo	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.

See footnote at end of table.

TABLE 4.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
69*: Manzano	Severe: floods.	Moderate: small stones.	Severe: small stones.	Slight.
70-- Tres Hermanos	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
71*: Tres Hermanos	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
Lehmans	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Slight.
72*: Tres Hermanos	Slight	Slight	Moderate: slope.	Slight.
Upton	Severe: cemented pan.	Severe: cemented pan.	Severe: small stones, cemented pan.	Moderate: dusty.
73*: White House	Slight	Slight	Moderate: slope, small stones, percs slowly.	Slight.
Ruidoso	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 5.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1*:											
Abrazo	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Luzena	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
2*:											
Abrazo	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Luzena	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
3---- Anthony	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
4---- Boysag	Very poor.	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
5*:											
Boysag	Very poor.	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Abrazo	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Santana	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
6*:											
Bucklebar	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Sonoita	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Continental	Very poor.	Very poor.	Poor	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
7*:											
Carnero	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
Santa Fe	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
8---- Conger	Poor	Poor	Fair	Very poor.	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
9*:											
Conger	Poor	Poor	Fair	Very poor.	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
Stellar	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
10*:											
Continental	Very poor.	Very poor.	Poor	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
Nickel	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
11*:											
Dagflat	Very poor.	Very poor.	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Santa Fe	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
12*, 13*:											
Encierro	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Rock outcrop.											
14*:											
Gaddes	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Ruidoso	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
15*:											
Gaddes	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Santa Fe	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Rock outcrop.											
16--- Gila Variant	Good	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
17--- Guy	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
18*:											
Guy	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Lonti	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
19--- Haverson	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
20*:											
Hondale	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Verhalen	Poor	Poor	Fair	---	Poor	Poor	Poor	Poor	---	Poor	Poor.
21--- Jonale	Poor	Fair	Fair	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
22*:											
Judd	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Manzano	Poor	Fair	Fair	---	Poor	Poor	Poor	Fair	---	Poor	Poor.
23*:											
Lehmans	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Lithic Haplargids.											

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
24*: Lithic Haplargids.											
Rock outcrop.											
25, 26---------- Lonti	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
27*: Lonti----------	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Denver Variant----	Very poor.	Very poor.	Good	---	Good	Poor	Very poor.	Poor	---	Very poor.	Good.
28*: Lonti----------	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Manzano----------	Poor	Fair	Fair	---	Poor	Poor	Poor	Fair	---	Poor	Poor.
29*: Lonti----------	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Ustorthents.											
30---------- Luzena	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
31*: Luzena----------	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop.											
32, 33---------- Manzano	Good	Good	Good	---	Fair	Fair	Fair	Good	---	Fair	Fair.
34*: Manzano----------	Poor	Poor	Good	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Ruidoso----------	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
35*: Mimbres----------	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Arizo----------	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Riverwash.											
36---------- Muzzler	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
37*: Muzzler----------	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop.											

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
38*:											
Nickel	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Upton	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
39*, 40*:											
Oro Grande	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Fair.
Rock outcrop.											
41*.											
Orthents											
42	Poor	Poor	Good	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
Paymaster											
43*:											
Paymaster	Good	Good	Good	---	Good	Fair	Poor	Good	---	Poor	Good.
Ellicott	Very poor.	Very poor.	Poor	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
44*:											
Paymaster	Good	Good	Good	---	Good	Fair	Very poor.	Good	---	Poor	Good.
Ellicott	Very poor.	Very poor.	Poor	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
45*:											
Paymaster	Fair	Good	Fair	---	Good	Poor	Very poor.	Fair	---	Very poor.	Fair.
Ellicott	Very poor.	Very poor.	Poor	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
Manzano	Poor	Fair	Fair	---	Poor	Poor	Poor	Fair	---	Poor	Poor.
46*:											
Pits.											
Dumps.											
47	Very poor.	Very poor.	Poor	---	Very poor.	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.
Plack											
48*:											
Plack Variant	Very poor.	Very poor.	Fair	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Poor.
Guy	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
49*:											
Plack Variant	Very poor.	Very poor.	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Guy	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
50*.											
Riverwash											

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
51*: Rock outcrop.											
Graham	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
52*: Rock outcrop.											
Lithic Ustorthents.											
53*: Rock outcrop.											
Luzena	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
54*: Rock outcrop.											
Muzzler	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
55--- Ruidoso	Fair	Good	Good	---	Fair	Poor	Very poor.	Fair	---	Poor	Fair.
56*: Ruidoso	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Muzzler	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
57*: Sampson	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Dagflat	Very poor.	Very poor.	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
58*: Sanloren	Poor	Poor	Good	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Majada Variant	Fair	Good	Good	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
59*, 60*, 61*: Santa Fe	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Rock outcrop.											
62--- Santana	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
63*, 64*: Santana	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Rock outcrop.											
65*: Stellar	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Mohave	Poor	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
66*:											
Stellar	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Verhalen	Poor	Poor	Fair	---	Poor	Poor	Poor	Poor	---	Poor	Poor.
Mimbres	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
67----- Stirk Variant	Good	Good	Fair	---	Poor	Good	Good	Fair	---	Good	Poor.
68----- Tesajo	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
69*:											
Tesajo	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Manzano	Poor	Fair	Fair	---	Poor	Poor	Poor	Fair	---	Poor	Poor.
70----- Tres Hermanos	Very poor.	Very poor.	Poor	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
71*:											
Tres Hermanos	Very poor.	Very poor.	Poor	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
Lehmans	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
72*:											
Tres Hermanos	Very poor.	Very poor.	Poor	---	Fair	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
Upton	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
73*:											
White House	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Ruidoso	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1*:						
Abrazo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: large stones.
Luzena	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength.	Severe: thin layer.
2*:						
Abrazo	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: large stones, slope.
Luzena	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.
3*:						
Anthony	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Slight.
4*:						
Boysag	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.
5*:						
Boysag	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength.	Severe: thin layer.
Abrazo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, thin layer.
Santana	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
6*:						
Bucklebar	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
Sonoita	Slight	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Continental	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
7*:						
Carnero	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
Santa Fe	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.

See footnote at end of table.

TABLE 6.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
8---------- Conger	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: thin layer.
9*: Conger----------	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: thin layer.
Stellar----------	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
10*: Continental------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Nickel----------	Severe: small stones.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.
11*: Dagflat----------	Severe: depth to rock, cutbanks cave.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Moderate: slope, thin layer.
Santa Fe----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: thin layer.
12*, 13*: Encierro----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.
Rock outcrop.						
14*: Gaddes----------	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: slope, shrink-swell.	Moderate: small stones, large stones, slope.
Ruidoso----------	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
15*: Gaddes----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Santa Fe----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: thin layer.
Rock outcrop.						
16---------- Gila Variant	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
17---------- Guy	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
18*: Guy----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.

See footnote at end of table.

TABLE 6.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
18*: Lonti	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: small stones, slope.
19--- Haverson	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Slight.
20*: Hondale	Slight	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Verhalen	Severe: cutbanks cave.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
21--- Jonale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
22*: Judd	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Manzano	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell	Severe: low strength.	Slight.
23*: Lehmans	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength.	Severe: thin layer.
Lithic Haplargids.						
24*: Lithic Haplargids.						
Rock outcrop.						
25--- Lonti	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
26--- Lonti	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: small stones.
27*: Lonti	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: small stones, slope.
Denver Variant	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
28*: Lonti	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: small stones, slope.

See footnote at end of table.

TABLE 6.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
28*: Manzano	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength, floods, frost action.	Slight.
29*: Lonti	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Ustorthents.						
30---- Luzena	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: small stones, slope, thin layer.
31*: Luzena	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.
Rock outcrop.						
32, 33---- Manzano	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength, floods, frost action.	Slight.
34*: Manzano	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
Ruidoso	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: thin layer.
35*: Mimbres	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Severe: floods.
Arizo	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: droughty, floods.
Riverwash.						
36---- Muzzler	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, low strength, slope.	Severe: large stones, slope, thin layer.
37*: Muzzler	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, low strength, slope.	Severe: large stones, slope, thin layer.
Rock outcrop.						
38*: Nickel	Severe: small stones.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.

See footnote at end of table.

TABLE 6.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
38*: Upton	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: thin layer.
39*: Oro Grande	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, thin layer.
Rock outcrop.						
40*: Oro Grande	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
Rock outcrop.						
41*. Orthents						
42---------- Paymaster	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, slope.
43*, 44*: Paymaster	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, frost action.	Slight.
Ellicott	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: droughty, floods.
45*: Paymaster	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, frost action.	Slight.
Ellicott	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: droughty, floods.
Manzano	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength, floods, frost action.	Slight.
46*: Pits.						
Dumps.						
47---------- Plack	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan.	Severe: thin layer.
48*: Plack Variant	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.
Guy	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones.

See footnote at end of table.

TABLE 6.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
49*:						
Plack Variant----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Guy----------	Severe: cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
50*. Riverwash						
51*: Rock outcrop.						
Graham----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: shrink-swell, slope, depth to rock.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer, too clayey.
52*: Rock outcrop. Lithic Ustorthents.						
53*: Rock outcrop.						
Luzena----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.
54*: Rock outcrop.						
Muzzler----------	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, low strength, slope.	Severe: large stones, slope, thin layer.
55---------- Ruidoso	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
56*: Ruidoso----------	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Muzzler----------	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, low strength.	Severe: large stones, thin layer.
57*: Sampson----------	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
Dagflat----------	Severe: depth to rock, cutbanks cave.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Moderate: thin layer.
58*: Sanloren----------	Moderate: too clayey, large stones.	Moderate: shrink-swell, large stones.	Moderate: large stones.	Moderate: shrink-swell, slope, large stones.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 6.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
58*: Majada Variant	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: large stones.
59*: Santa Fe	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
Rock outcrop.						
60*, 61*: Santa Fe	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: thin layer.
Rock outcrop.						
62 Santana	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
63*: Santana	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
Rock outcrop.						
64*: Santana	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
65*: Stellar	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
Mohave	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
66*: Stellar	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
Verhalen	Severe: cutbanks cave.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Mimbres	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Severe: excess salt.
67 Stirk Variant	Moderate: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: droughty.
68 Tesajo	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: small stones.
69*: Tesajo	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: small stones.

See footnote at end of table.

TABLE 6.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
69*: Manzano	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Moderate: small stones.
70 Tres Hermanos	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: small stones.
71*: Tres Hermanos	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: small stones.
Lehmans	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength.	Severe: thin layer.
72*: Tres Hermanos	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
Upton	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: thin layer.
73*: White House	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: large stones.
Ruidoso	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1*:					
Abrazo	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Luzena	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
2*:					
Abrazo	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Luzena	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
3 Anthony	Moderate: floods.	Severe: seepage, floods.	Moderate: floods.	Moderate: floods.	Good.
4 Boysag	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
5*:					
Boysag	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Abrazo	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Santana	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
6*:					
Bucklebar	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Sonoita	Slight	Severe: seepage.	Slight	Slight	Good.
Continental	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
7*:					
Carnero	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Santa Fe	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.

See footnote at end of table.

TABLE 7.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
8---------- Conger	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
9*: Conger----------	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
Stellar----------	Severe: percs slowly.	Slight----------	Slight----------	Slight----------	Fair: small stones.
10*: Continental--------	Severe: percs slowly.	Moderate: seepage.	Slight----------	Slight----------	Good.
Nickel----------	Moderate: slope.	Severe: slope, small stones.	Severe: small stones.	Moderate: slope.	Poor: small stones.
11*: Dagflat----------	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
Santa Fe----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
12*, 13*: Encierro----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
14*: Gaddes----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
Ruidoso----------	Moderate: percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Poor: too clayey.
15*: Gaddes----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Santa Fe----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
16---------- Gila Variant	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
17---------- Guy	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Severe: seepage, slope.	Poor: slope.
18*: Guy----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.

See footnote at end of table.

TABLE 7.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
18*:					
Lonti	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: hard to pack.
19	Moderate:	Severe:	Moderate:	Moderate:	Fair:
Haverson	percs slowly, floods.	floods.	floods, too clayey.	floods.	too clayey.
20*:					
Hondale	Severe: percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
Verhalen	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: floods.	Poor: too clayey, hard to pack.
21	Severe:	Severe:	Severe:	Severe:	Poor:
Jonale	slope.	slope.	slope.	slope.	slope.
22*:					
Judd	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
Manzano	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
23*:					
Lehmans	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
Lithic Haplargids.					
24*:					
Lithic Haplargids.					
Rock outcrop.					
25	Severe:	Severe:	Severe:	Severe:	Poor:
Lonti	percs slowly, slope.	slope.	slope.	slope.	hard to pack, slope.
26	Severe:	Moderate:	Slight	Slight	Poor:
Lonti	percs slowly.	slope.			hard to pack.
27*:					
Lonti	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: hard to pack.
Denver Variant	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
28*:					
Lonti	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: hard to pack.
Manzano	Severe: percs slowly.	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
29*:					
Lonti	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
Ustorthents.					

See footnote at end of table.

TABLE 7.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
30---------- Luzena	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
31*: Luzena----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
32, 33---------- Manzano	Severe: percs slowly.	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
34*: Manzano----------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
Ruidoso----------	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey.
35*: Mimbres----------	Severe: floods, percs slowly.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Arizo----------	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, too sandy.	Severe: floods.	Poor: seepage, too sandy, small stones.
Riverwash.					
36---------- Muzzler	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
37*: Muzzler----------	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
38*: Nickel----------	Moderate: slope.	Severe: slope, small stones.	Severe: small stones.	Moderate: slope.	Poor: small stones.
Upton----------	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan, large stones.	Severe: cemented pan.	Poor: area reclaim.
39*: Oro Grande----------	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones.
Rock outcrop.					

See footnote at end of table.

TABLE 7.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
40*:					
Oro Grande	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
Rock outcrop.					
41*.					
Orthents					
42	Moderate:	Severe:	Severe:	Severe:	Fair:
Paymaster	slope.	seepage, slope.	seepage.	seepage.	slope, thin layer.
43*, 44*:					
Paymaster	Severe: poor filter.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
Ellicott	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, too sandy.	Severe: floods.	Poor: seepage, too sandy.
45*:					
Paymaster	Severe: poor filter.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
Ellicott	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, too sandy.	Severe: floods.	Poor: seepage, too sandy.
Manzano	Severe: percs slowly.	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
46*:					
Pits.					
Dumps.					
47	Severe:	Severe:	Moderate:	Severe:	Poor:
Plack	cemented pan.	cemented pan.	cemented pan.	cemented pan.	area reclaim.
48*:					
Plack Variant	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Guy	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
49*:					
Plack Variant	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Guy	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
50*.					
Riverwash					
51*:					
Rock outcrop.					

See footnote at end of table.

TABLE 7.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
51*:					
Graham	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
52*:					
Rock outcrop.					
Lithic Ustorthents.					
53*:					
Rock outcrop.					
Luzena	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
54*:					
Rock outcrop.					
Muzzler	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
55---					
Ruidoso	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, low strength.
56*:					
Ruidoso	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, low strength.
Muzzler	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
57*:					
Sampson	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Dagflat	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
58*:					
Sanloren	Severe: percs slowly.	Moderate: seepage, slope.	Severe: large stones.	Slight	Poor: large stones.
Majada Variant	Severe: percs slowly, large stones.	Severe: slope, large stones.	Severe: large stones.	Moderate: slope.	Poor: large stones.
59*:					
Santa Fe	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Rock outcrop.					

See footnote at end of table.

TABLE 7.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
60*, 61*: Santa Fe	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
62--- Santana	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
63*: Santana	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Rock outcrop.					
64*: Santana	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
65*: Stellar	Severe: percs slowly.	Slight	Slight	Slight	Fair: small stones.
Mohave	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Good.
66*: Stellar	Severe: percs slowly.	Slight	Slight	Slight	Fair: small stones.
Verhalen	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: floods.	Poor: too clayey, hard to pack.
Mimbres	Severe: percs slowly.	Severe: floods.	Severe: excess salt.	Moderate: floods.	Good.
67--- Stirk Variant	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey, hard to pack.
68--- Tesajo	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
69*: Tesajo	Severe: poor filter.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
Manzano	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
70--- Tres Hermanos	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Poor: small stones.
71*: Tres Hermanos	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Poor: small stones.

See footnote at end of table.

TABLE 7.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
71*: Lehmans	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
72*: Tres Hermanos	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Poor: small stones.
Upton	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan, large stones.	Severe: cemented pan.	Poor: area reclaim.
73*: White House	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Fair: small stones.
Ruidoso.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1*:				
Abrazo	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Luzena	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
2*:				
Abrazo	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Luzena	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
3---- Anthony	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
4---- Boysag	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
5*:				
Boysag	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Abrazo	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Santana	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
6*:				
Bucklebar	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Sonoita	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Continental	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
7*:				
Carnero	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Santa Fe	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.

See footnote at end of table.

TABLE 8.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
8---------- Conger	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
9*:				
Conger----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Stellar----------	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
10*:				
Continental----------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
Nickel----------	Good----------	Probable----------	Probable----------	Poor: small stones.
11*:				
Dagflat----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
Santa Fe----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
12*:				
Encierro----------	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
13*:				
Encierro----------	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
14*:				
Gaddes----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Ruidoso----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
15*:				
Gaddes----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Santa Fe----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				

See footnote at end of table.

TABLE 8.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
16--- Gila Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
17--- Guy	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
18*: Guy---	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Lonti---	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
19--- Haverson	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
20*: Hondale---	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Verhalen---	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
21--- Jonale	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
22*: Judd---	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Manzano---	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
23*: Lehmans---	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Lithic Haplargids.				
24*: Lithic Haplargids.				
Rock outcrop.				
25--- Lonti	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
26--- Lonti	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
27*: Lonti---	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Denver Variant---	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 8.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
28*:				
Lonti	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Manzano	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
29*:				
Lonti	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Ustorthents.				
30				
Luzena	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
31*:				
Luzena	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Rock outcrop.				
32				
Manzano	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
33				
Manzano	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
34*:				
Manzano	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ruidoso	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
35*:				
Mimbres	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Arizo	Good	Probable	Probable	Poor: small stones, area reclaim.
Riverwash.				
36				
Muzzler	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
37*:				
Muzzler	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Rock outcrop.				

See footnote at end of table.

TABLE 8.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
38*:				
Nickel	Good	Probable	Probable	Poor: small stones.
Upton	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
39*:				
Oro Grande	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
Rock outcrop.				
40*:				
Oro Grande	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
41*. Orthents				
42 Paymaster	Good	Probable	Probable	Fair: small stones, slope.
43*, 44*:				
Paymaster	Good	Probable	Probable	Fair: small stones.
Ellicott	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
45*:				
Paymaster	Good	Probable	Probable	Fair: small stones.
Ellicott	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
Manzano	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
46*:				
Pits.				
Dumps.				
47 Plack	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
48*:				
Plack Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Guy	Good	Probable	Probable	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 8.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
49*:				
Plack Variant	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Guy	Poor: slope.	Probable	Probable	Poor: large stones, area reclaim.
50*. Riverwash				
51*: Rock outcrop.				
Graham	Poor: area reclaim, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, thin layer.
52*: Rock outcrop. Lithic Ustorthents.				
53*: Rock outcrop.				
Luzena	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
54*: Rock outcrop.				
Muzzler	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
55--- Ruidoso	Poor: low stregth.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
56*:				
Ruidoso	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Muzzler	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
57*:				
Sampson	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Dagflat	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
58*:				
Sanloren	Fair: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.

See footnote at end of table.

TABLE 8.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
58*:				
Majada Variant	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
59*:				
Santa Fe	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Rock outcrop.				
60*, 61*:				
Santa Fe	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
62 Santana	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
63*:				
Santana	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Rock outcrop.				
64*:				
Santana	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Rock outcrop.				
65*:				
Stellar	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Mohave	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
66*:				
Stellar	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Verhalen	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mimbres	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
67 Stirk Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
68 Tesajo	Good	Probable	Probable	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 8.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
69*:				
Tesajo	Good	Probable	Probable	Poor: small stones, area reclaim.
Manzano	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
70 Tres Hermanos	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
71*:				
Tres Hermanos	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Lehmans	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
72*:				
Tres Hermanos	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Upton	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
73*:				
White House	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Ruidoso.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1*:						
Abrazo	Severe: slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Luzena	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
2*:						
Abrazo	Severe: slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Luzena	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope.
3----- Anthony	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
4----- Boysag	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Slope, depth to rock.	Slope, depth to rock, percs slowly.
5*:						
Boysag	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Slope, depth to rock.	Slope, depth to rock, percs slowly.
Abrazo	Severe: slope.	Severe: thin layer.	Deep to water	Soil blowing, percs slowly, depth to rock.	Slope, depth to rock, soil blowing.	Slope, depth to rock, percs slowly.
Santana	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock	Slope, depth to rock.	Slope, depth to rock.
6*:						
Bucklebar	Moderate: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Erodes easily, soil blowing.	Erodes easily.
Sonoita	Severe: seepage.	Slight	Deep to water	Soil blowing, slope.	Soil blowing---	Favorable.
Continental	Moderate: seepage.	Moderate: seepage, piping.	Deep to water	Droughty, soil blowing, percs slowly.	Soil blowing, percs slowly.	Droughty, percs slowly.
7*:						
Carnero	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Soil blowing, percs slowly, depth to rock.	Depth to rock, soil blowing, percs slowly.	Depth to rock, percs slowly.
Santa Fe	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
8----- Conger	Severe: cemented pan.	Severe: piping.	Deep to water	Cemented pan---	Cemented pan---	Cemented pan.

See footnote at end of table.

TABLE 9.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
9*:						
Conger	Severe: cemented pan.	Severe: piping.	Deep to water	Cemented pan, slope.	Cemented pan	Cemented pan.
Stellar	Slight	Moderate: piping.	Deep to water	Percs slowly	Favorable	Percs slowly.
10*:						
Continental	Moderate: seepage.	Moderate: seepage, piping.	Deep to water	Droughty, percs slowly.	Percs slowly	Droughty, percs slowly.
Nickel	Severe: slope.	Severe: seepage.	Deep to water	Droughty, slope.	Small stones, slope.	Slope, droughty.
11*:						
Dagflat	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Santa Fe	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
12*, 13*:						
Encierro	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Rock outcrop.						
14*:						
Gaddes	Severe: slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Ruidoso	Moderate: slope.	Slight	Deep to water	Percs slowly, slope.	Percs slowly	Percs slowly.
15*:						
Gaddes	Severe: slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Santa Fe	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.						
16--- Gila Variant	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing, floods.	Erodes easily, soil blowing.	Erodes easily.
17--- Guy	Severe: seepage, slope.	Severe: piping.	Deep to water	Large stones, slope.	Slope, large stones.	Large stones, slope.
18*:						
Guy	Severe: seepage, slope.	Severe: piping.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Lonti	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.

See footnote at end of table.

TABLE 9.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
19---------- Haverson	Moderate: slope.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
20*: Hondale----------	Slight---------	Moderate: piping.	Deep to water	Soil blowing, percs slowly.	Soil blowing, percs slowly.	Percs slowly.
Verhalen---------	Slight---------	Moderate: hard to pack, excess salt.	Deep to water	Slow intake, percs slowly, excess salt.	Percs slowly---	Percs slowly.
21---------- Jonale	Severe: slope.	Severe: piping.	Deep to water	Slope----------	Slope----------	Slope.
22*: Judd----------	Severe: slope.	Severe: piping.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
Manzano----------	Slight---------	Moderate: piping.	Deep to water	Favorable------	Favorable------	Favorable.
23*: Lehmans----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Lithic Haplargids.						
24*: Lithic Haplargids.						
Rock outcrop.						
25---------- Lonti	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
26---------- Lonti	Moderate: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
27*: Lonti----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Denver Variant---	Moderate: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
28*: Lonti----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Manzano----------	Moderate: slope.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
29*: Lonti----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Ustorthents.						

See footnote at end of table.

TABLE 9.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
30---------- Luzena	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
31*: Luzena----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope.
Rock outcrop.						
32, 33---------- Manzano	Slight---------	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
34*: Manzano----------	Slight---------	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
Ruidoso----------	Moderate: slope.	Favorable------	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
35*: Mimbres----------	Moderate: seepage.	Moderate: piping.	Deep to water	Erodes easily, floods.	Erodes easily	Erodes easily.
Arizo----------	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy------	Droughty.
Riverwash.						
36---------- Muzzler	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
37*: Muzzler----------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
38*: Nickel----------	Severe: slope.	Severe: seepage.	Deep to water	Droughty, slope.	Small stones, slope.	Slope, droughty.
Upton----------	Severe: cemented pan.	Moderate: large stones.	Deep to water	Droughty, cemented pan, slope.	Large stones, cemented pan.	Large stones, droughty, cemented pan.
39*, 40*: Oro Grande-------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
41*. Orthents						
42---------- Paymaster	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Slope----------	Slope.
43*, 44*: Paymaster--------	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.

See footnote at end of table.

TABLE 9.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
43*, 44*: Ellicott	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy	Droughty.
45*: Paymaster	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
Ellicott	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy	Droughty.
Manzano	Slight	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
46*: Pits.						
Dumps.						
47 Plack	Severe: cemented pan.	Severe: thin layer.	Deep to water	Cemented pan, slope.	Cemented pan	Cemented pan.
48*: Plack Variant	Severe: depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
Guy	Severe: seepage.	Severe: piping.	Deep to water	Droughty, slope.	Large stones	Large stones, droughty.
49*: Plack Variant	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Guy	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, large stones, slope.	Slope, large stones.	Large stones, slope, droughty.
50*. Riverwash						
51*: Rock outcrop.						
Graham	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
52*: Rock outcrop.						
Lithic Ustorthents.						
53*: Rock outcrop.						
Luzena	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope.
54*: Rock outcrop.						
Muzzler	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 9.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
55---------- Ruidoso	Moderate: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
56*:						
Ruidoso----------	Moderate: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
Muzzler----------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
57*:						
Sampson----------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Fast intake, slope.	Soil blowing---	Favorable.
Dagflat----------	Severe: seepage.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
58*:						
Sanloren----------	Moderate: seepage, slope.	Moderate: large stones.	Deep to water	Large stones, slope.	Large stones, erodes easily.	Large stones, erodes easily.
Majada Variant---	Severe: slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
59*, 60*, 61*:						
Santa Fe----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.						
62---------- Santana	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Droughty, fast intake, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
63*:						
Santana----------	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
64*:						
Santana----------	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.						
65*:						
Stellar----------	Slight---------	Moderate: piping.	Deep to water	Percs slowly---	Favorable------	Percs slowly.
Mohave----------	Moderate: slope.	Moderate: piping.	Deep to water	Slope----------	Favorable------	Favorable.
66*:						
Stellar----------	Slight---------	Moderate: piping.	Deep to water	Percs slowly---	Favorable------	Percs slowly.
Verhalen---------	Slight---------	Moderate: hard to pack, excess salt.	Deep to water	Slow intake, percs slowly, excess salt.	Percs slowly---	Percs slowly.

See footnote at end of table.

TABLE 9.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
66*:						
Mimbres	Moderate: seepage.	Severe: excess salt.	Deep to water	Erodes easily, excess salt.	Erodes easily	Excess salt, erodes easily.
67 Stirk Variant	Slight	Severe: hard to pack.	Deep to water	Droughty, percs slowly.	Percs slowly	Droughty, percs slowly.
68 Tesajo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope	Slope, droughty.
69*:						
Tesajo	Severe: seepage.	Severe: seepage.	Deep to water	Droughty	Favorable	Droughty.
Manzano	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
70 Tres Hermanos	Moderate: seepage, slope.	Slight	Deep to water	Slope	Favorable	Favorable.
71*:						
Tres Hermanos	Moderate: seepage, slope.	Slight	Deep to water	Slope	Favorable	Favorable.
Lehmans	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
72*:						
Tres Hermanos	Moderate: seepage.	Slight	Deep to water	Soil blowing	Favorable	Favorable.
Upton	Severe: cemented pan.	Moderate: large stones.	Deep to water	Droughty, cemented pan.	Large stones, cemented pan.	Large stones, droughty, cemented pan.
73*:						
White House	Moderate: slope.	Slight	Deep to water	Percs slowly, slope.	Percs slowly	Percs slowly.
Ruidoso.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1*:											
Abrazo	0-4	Cobbly clay loam	ML, CL	A-6, A-7	15-35	85-95	80-90	75-85	60-70	35-45	10-20
	4-24	Clay, clay loam	CL, CH	A-7	0	95-100	95-100	85-100	75-90	40-60	15-35
	24-28	Clay, gravelly clay.	CL, CH	A-7	0	70-100	65-100	60-100	55-85	40-60	20-35
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Luzena	0-3	Cobbly loam	CL-ML	A-4	25-30	90-100	85-90	70-85	50-70	25-30	5-10
	3-12	Gravelly clay, clay.	CL, CH	A-7	5-20	70-100	65-95	55-80	50-75	45-55	20-30
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
2*:											
Abrazo	0-2	Very cobbly clay loam.	ML, CL	A-6, A-7	15-35	85-95	80-90	75-85	60-70	35-45	10-20
	2-27	Clay, clay loam	CL, CH	A-7	0	95-100	95-100	85-100	75-90	40-60	15-35
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Luzena	0-1	Gravelly clay loam.	SC, SM-SC, GC, GM-GC	A-4, A-6	0-15	70-85	70-80	60-70	40-50	25-40	5-20
	1-14	Gravelly clay, clay.	CL, CH	A-7	5-20	70-100	65-95	55-80	50-75	45-55	25-35
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
3	0-4	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	55-85	35-65	20-30	NP-5
Anthony	4-60	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	95-100	90-100	50-85	30-50	20-30	NP-5
4	0-2	Clay loam	CL	A-6	0	90-100	85-95	70-85	50-70	30-40	10-20
Boysag	2-14	Clay loam, clay, gravelly clay loam.	CL	A-7	0	90-100	70-85	70-80	60-70	40-50	15-25
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
5*:											
Boysag	0-3	Sandy clay loam	CL	A-6	0	90-100	85-95	70-85	50-70	30-40	10-20
	3-18	Clay loam, clay, gravelly clay loam.	CL	A-7	0	90-100	70-85	70-80	60-70	40-50	15-25
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Abrazo	0-10	Sandy loam	SM	A-2	0	80-100	75-100	45-65	25-35	20-25	NP-5
	10-25	Clay, clay loam	CL, CH	A-7	0	95-100	95-100	85-100	75-90	40-60	15-35
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Santana	0-4	Sandy loam	SM	A-2, A-4	0	95-100	95-100	60-70	30-40	20-25	NP-5
	4-14	Gravelly loam, sandy clay loam, loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	70-85	65-85	50-70	35-55	25-35	5-15
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
6*:											
Bucklebar	0-3	Sandy loam	SM, ML	A-2, A-4	0	95-100	95-100	60-85	30-55	15-25	NP-5
	3-60	Sandy clay loam, clay loam.	SM-SC, SC, CL-ML, CL	A-6, A-4	0-5	90-100	90-100	60-85	40-60	25-35	5-15

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
6*:											
Sonoita	0-4	Loamy sand	SM	A-1, A-2	0-5	70-100	65-95	30-60	10-20	---	NP
	4-60	Gravelly sandy loam, sandy loam, gravelly loamy sand.	SM-SC	A-2	0-5	70-95	65-95	40-65	15-35	15-25	NP-5
Continental	0-7	Sandy loam	SM-SC	A-2	0	90-100	90-100	55-70	25-35	20-30	5-10
	7-39	Gravelly clay, clay, sandy clay.	CL, CH, SC	A-7	0-5	80-95	50-90	50-70	35-65	45-55	20-30
	39-60	Silty clay loam, clay loam, sandy clay loam.	CL-ML, CL	A-4, A-6	0-5	90-100	90-100	80-90	50-65	25-40	5-15
7*:											
Carnero	0-3	Fine sandy loam	SM	A-4, A-2	0-5	85-100	75-100	45-75	25-50	20-25	NP-5
	3-34	Clay, silty clay loam, clay loam.	CL, CH	A-7	0-5	85-100	80-100	80-100	60-95	40-55	15-30
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Santa Fe	0-3	Gravelly sandy loam.	GM, SM	A-1, A-2	0-10	55-80	50-75	30-50	15-30	20-25	NP-5
	3-18	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-10	35-55	30-50	25-45	20-35	25-35	10-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
8	0-2	Gravelly loam	SM-SC	A-4	0-5	70-80	60-75	55-70	40-50	20-30	5-10
Conger	2-13	Clay loam	CL-ML	A-4	0-5	90-100	80-100	70-85	60-70	20-30	5-10
	13	Indurated	---	---	---	---	---	---	---	---	---
9*:											
Conger	0-1	Fine sandy loam	SM	A-4, A-2	0-5	85-100	75-100	45-75	25-50	20-25	NP-5
	1-10	Sandy clay loam, gravelly clay loam.	SM-SC	A-4, A-6	0	70-90	60-85	55-80	35-50	20-30	5-10
	10	Indurated	---	---	---	---	---	---	---	---	---
Stellar	0-6	Sandy clay loam	SC, SM-SC, CL-ML, CL	A-6, A-4	0	100	100	85-95	40-60	20-35	5-15
	6-60	Clay, sandy clay, clay loam.	CH, CL, SC	A-7	0	100	100	80-95	45-90	40-60	15-30
10*:											
Continental	0-5	Sandy clay loam	SC	A-6	0	90-100	90-100	75-90	35-50	30-40	10-20
	5-24	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	70-80	40-55	15-30
	24-60	Very gravelly sandy clay loam, gravelly sandy clay loam, gravelly fine sandy loam.	GM-GC, GM, SM-SC, SM	A-2	0-15	60-75	45-60	35-55	20-30	20-40	5-15
Nickel	0-8	Gravelly sandy loam.	GM, SM	A-1, A-2	0-5	55-80	50-75	30-70	10-30	---	NP
	8-19	Very gravelly sandy loam, very gravelly fine sandy loam, gravelly sandy loam.	GP-GM, GM, SP-SM, SM	A-1	0-10	30-60	20-55	15-35	5-15	---	NP
	19-60	Very gravelly sandy loam, very gravelly loamy sand, gravelly sandy loam.	GP-GM, GM, SP-SM, SM	A-1	0-10	30-60	20-55	15-35	5-15	---	NP

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
11*:											
Dagflat---------	0-8	Loam----------	CL-ML	A-4	0	85-100	80-100	70-90	50-65	20-30	5-10
	8-31	Coarse sandy loam, sandy clay loam, gravelly sandy clay loam.	SM-SC	A-2, A-4	0	80-100	60-100	40-85	20-50	25-30	5-10
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Santa Fe---------	0-2	Gravelly sandy loam.	GM, SM	A-1, A-2	0-10	55-80	50-75	30-50	15-30	20-25	NP-5
	2-18	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-10	35-55	30-50	25-45	20-35	25-35	10-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
12*, 13*:											
Encierro---------	0-2	Gravelly loam----	GM, ML, SM	A-4	0-5	65-85	60-80	50-75	35-60	15-25	NP-5
	2-9	Gravelly clay, clay, clay loam.	CL, SC, CH, GC	A-6, A-7	0-5	55-85	50-80	45-70	35-55	35-55	15-25
	9	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
14*:											
Gaddes----------	0-2	Gravelly sandy loam.	SM	A-1	0-10	75-95	65-75	30-40	15-25	20-30	NP-5
	2-22	Gravelly sandy clay loam, gravelly clay loam.	SC	A-2	0-25	80-90	55-70	25-40	20-35	30-40	10-20
	22	Weathered bedrock	---	---	---	---	---	---	---	---	---
Ruidoso---------	0-3	Clay loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	3-60	Clay loam, clay, sandy clay.	CH, CL	A-6, A-7	0	100	100	90-100	70-95	35-65	15-35
15*:											
Gaddes----------	0-2	Gravelly sandy loam.	SM	A-1	0-10	75-95	65-75	30-40	15-25	20-30	NP-5
	2-22	Gravelly sandy clay loam, gravelly clay loam.	SC	A-2	0-25	80-90	55-70	25-40	20-35	30-40	10-20
	22	Weathered bedrock	---	---	---	---	---	---	---	---	---
Santa Fe---------	0-2	Gravelly sandy loam.	GM, SM	A-1, A-2	0-10	55-80	50-75	30-50	15-30	20-25	NP-5
	2-18	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-10	35-55	30-50	25-45	20-35	25-35	10-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
16---------- Gila Variant	0-8	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	80-85	40-55	20-30	NP-10
	8-14	Loam----------	CL-ML, ML	A-4	0	100	100	85-95	60-75	25-30	5-10
	14-60	Stratified fine sandy loam to silty clay loam.	CL-ML, ML	A-4, A-6	0	100	100	75-95	50-80	25-40	5-15

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
17---------- Guy	0-8	Very cobbly loam	SM	A-2, A-4, A-1	0-50	70-100	60-70	40-60	20-50	25-35	NP-10
	8-31	Gravelly sandy loam, sandy loam, gravelly loam.	SM	A-1, A-2, A-4	0-25	70-100	65-95	40-70	20-50	20-30	NP-5
	31-60	Gravelly loamy sand.	SM	A-1	5-10	70-80	60-70	30-40	10-25	---	NP
18*:											
Guy----------	0-8	Gravelly loam----	SM	A-2, A-4, A-1	0-10	70-100	60-70	40-60	20-50	25-35	NP-10
	8-60	Gravelly sandy loam, sandy loam, loam.	SM	A-1, A-2, A-4	0-25	70-100	65-95	40-70	20-50	20-30	NP-5
Lonti----------	0-6	Gravelly sandy clay loam.	SC	A-2, A-6	0-5	70-80	60-75	50-70	30-50	30-40	10-15
	6-25	Clay----------	CL, CH	A-7	0-5	100	100	70-100	75-95	40-55	15-30
	25-60	Gravelly sandy clay loam, gravelly clay loam.	GM-GC, SM-SC	A-2	0-5	55-80	50-75	40-60	20-35	20-30	5-10
19---------- Haverson	0-2	Silty clay loam	CL-ML, CL	A-4, A-6	0	95-100	80-100	75-95	60-80	20-40	5-15
	2-60	Stratified clay loam to sand.	ML	A-4	0	95-100	75-100	75-90	50-60	20-35	NP-10
20*:											
Hondale----------	0-5	Sandy loam-------	SM	A-2, A-4	0	100	100	50-75	20-40	---	NP
	5-28	Clay, clay loam, silty clay.	CL, CH	A-7	0	100	100	90-100	75-95	40-55	20-30
	28-60	Clay loam, sandy clay loam, sandy clay.	ML	A-4, A-6	0	100	100	80-100	50-80	30-40	5-15
Verhalen--------	0-10	Silty clay-------	CL, CH	A-7-6	0	95-100	95-100	90-100	70-95	45-65	25-40
	10-60	Clay, silty clay, clay loam.	CL, CH	A-7-6	0	95-100	95-100	90-100	70-95	45-65	25-40
21---------- Jonale	0-10	Sandy clay loam	CL-ML, CL, SM-SC, SM	A-4, A-6	0-5	100	100	80-90	35-55	25-35	5-15
	10-60	Sandy clay loam, loam, clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	95-100	90-100	80-95	35-65	25-35	5-15
22*:											
Judd----------	0-2	Loam----------	CL-ML	A-4	0	95-100	90-100	85-95	60-75	25-30	5-10
	2-18	Clay loam, clay	CL	A-6, A-7	0	95-100	90-100	85-100	70-90	35-50	15-30
	18-60	Loam, clay loam, sandy clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0-15	80-100	70-100	70-90	45-65	20-35	5-15
Manzano---------	0-15	Gravelly loam----	GM, ML, SM	A-4	0-5	65-85	60-80	50-75	35-60	15-25	NP-5
	15-35	Loam, clay loam	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-15
	35-60	Sandy loam-------	SM	A-2, A-4	0	100	100	60-70	30-40	20-30	NP-5
23*:											
Lehmans---------	0-1	Gravelly sandy clay loam.	GM, SM	A-2	0-15	60-80	55-75	40-65	20-35	30-40	5-15
	1-15	Clay, gravelly clay, gravelly clay loam.	CH, SC	A-7	0-5	75-100	55-80	50-75	40-65	50-60	30-40
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lithic Haplargids.											

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
24*: Lithic Haplargids.											
Rock outcrop.											
25---------- Lonti	0-4	Gravelly loam----	CL-ML, SM-SC	A-4	0-5	70-80	60-75	50-70	35-55	25-30	5-10
	4-23	Gravelly clay, gravelly clay loam.	CL, CH, SC	A-7	0-5	75-85	60-75	55-70	45-65	40-55	20-30
	23-60	Gravelly sandy clay loam, gravelly clay loam.	GM-GC, GC, SM-SC, CL-ML	A-2, A-4	0-5	55-80	50-75	45-70	30-55	25-35	5-15
26---------- Lonti	0-4	Gravelly clay loam.	GM, SM	A-6, A-7	0-5	55-80	50-75	45-65	35-50	35-45	10-15
	4-22	Clay----------	CL, CH	A-7	0-5	100	100	90-100	75-95	45-60	25-50
	22-60	Gravelly sandy loam.	GM-GC, GC, SM-SC, SC	A-2, A-4, A-6	0-5	55-80	50-75	45-65	25-40	25-35	5-15
27*: Lonti----------	0-4	Gravelly loam----	CL-ML, SM-SC	A-4	0-5	70-80	60-75	50-70	35-55	25-30	5-10
	4-23	Gravelly clay, gravelly clay loam.	CL, CH, SC	A-7	0-5	75-85	60-75	55-70	45-65	40-55	20-30
	23-60	Gravelly sandy clay loam.	GM-GC, GC, SM-SC, SC	A-2, A-4, A-6	0-5	55-80	50-75	45-65	25-40	25-35	5-15
Denver Variant--	0-2	Clay loam--------	CL-ML, CL	A-6	0	100	100	90-100	70-90	25-40	10-15
	2-30	Clay----------	CL, CH	A-7	0	100	100	90-100	75-95	45-65	20-40
	30-60	Gravelly clay----	CL, CH, GC	A-7	0	55-80	50-75	45-70	40-65	45-65	20-40
28*: Lonti----------	0-4	Gravelly loam----	CL-ML, SM-SC	A-4	0-5	70-80	60-75	50-70	35-55	25-30	5-10
	4-34	Clay----------	CL, CH	A-7	0-5	100	100	90-100	75-95	45-60	25-50
	34-60	Gravelly sandy clay loam.	GM-GC, GC, SM-SC, SC	A-2, A-4, A-6	0-5	55-80	50-75	45-65	25-40	25-35	5-15
Manzano----------	0-15	Loam----------	CL-ML	A-4	0	100	100	85-100	60-80	20-30	5-10
	15-60	Loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-15
29*: Lonti----------	0-4	Gravelly loam----	CL-ML, SM-SC	A-4	0-5	70-80	60-75	50-70	35-55	25-30	5-10
	4-29	Gravelly clay, gravelly clay loam.	CL, CH, SC	A-7	0-5	75-85	60-75	55-70	45-65	40-55	20-30
	29-60	Gravelly sandy clay loam, gravelly sandy loam.	GC, SC, GM-GC, SM-SC	A-2, A-4, A-6	0-5	55-80	50-75	45-65	25-40	25-35	5-15
Ustorthents.											
30---------- Luzena	0-4	Very gravelly sandy clay loam.	GC	A-2	0-15	35-60	30-50	25-45	15-35	35-50	10-15
	4-15	Gravelly clay, clay.	CL, CH	A-7	5-20	70-100	65-95	55-80	50-75	45-55	25-35
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
31*:											
Luzena	0-2	Gravelly loam	SC, SM-SC, GC, GM-GC	A-4, A-6	0-15	70-85	70-80	60-70	40-50	25-40	5-20
	2-16	Gravelly clay, clay.	CL, CH	A-7	5-20	70-100	65-95	55-80	50-75	45-55	25-35
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
32	0-3	Loam	CL-ML	A-4	0	100	100	85-100	60-80	20-30	5-10
Manzano	3-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-15
33	0-3	Loam	CL-ML	A-4	0	100	100	85-100	60-80	20-30	5-10
Manzano	3-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-15
34*:											
Manzano	0-20	Loam	CL-ML	A-4	0	100	100	85-100	60-80	20-30	5-10
	20-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-15
Ruidoso	0-10	Clay loam	CL	A-6, A-7	0	100	100	90-100	85-95	35-45	15-25
	10-60	Clay loam, clay, sandy clay.	CH, CL	A-6, A-7	0	100	100	90-100	70-95	35-65	15-35
35*:											
Mimbres	0-6	Loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	70-90	20-35	5-15
	6-60	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	100	100	90-100	75-95	25-45	10-25
Arizo	0-18	Loamy sand	SM	A-1, A-2	0	85-100	80-100	45-65	15-30	---	NP
	18-60	Very gravelly loamy sand, very gravelly sand.	GP-GM, GP	A-1	0	30-40	20-30	10-20	0-10	---	NP
Riverwash.											
36	0-3	Very cobbly clay loam.	CH	A-7	45-60	95-100	90-100	80-95	70-85	50-60	25-35
Muzzler	3-12	Very cobbly clay, very cobbly clay loam.	CL, CH	A-7	55-90	95-100	90-100	80-95	65-80	45-55	20-30
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
37*:											
Muzzler	0-2	Cobbly sandy loam	SM-SC	A-2, A-4	30-50	95-100	90-100	55-70	30-40	20-30	5-10
	2-19	Very cobbly clay, very cobbly clay loam.	CL, CH	A-7	55-90	95-100	90-100	80-95	65-80	45-55	20-30
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
38*:											
Nickel	0-6	Gravelly sandy loam.	GM, SM	A-1, A-2	0-5	55-80	50-75	30-70	10-30	---	NP
	6-19	Very gravelly sandy loam, very gravelly fine sandy loam, gravelly sandy loam.	GP-GM, GM, SP-SM, SM	A-1	0-10	30-60	20-55	15-35	5-15	---	NP
	19-60	Very gravelly silt loam, very gravelly loamy sand.	GP-GM, GM, SP-SM, SM	A-1	0-10	30-60	20-55	15-35	5-15	---	NP

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
38*:											
Upton----------	0-3	Gravelly loam----	CL, GC, SC	A-4, A-6	0-5	65-85	60-75	50-70	35-55	20-30	10-20
	3-13	Gravelly clay loam, very gravelly clay loam.	GC, SC	A-4, A-6, A-2	0-5	50-70	40-60	30-50	20-40	25-35	15-25
	13-20	Cemented---------	---	---	0-50	---	---	---	---	---	---
	20-60	Variable---------	---	---	0-20	---	---	---	---	---	---
39*:											
Oro Grande------	0-13	Very cobbly loam	GM, GM-GC	A-4	40-65	65-75	65-75	55-70	40-50	25-30	25-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
40*:											
Oro Grande------	0-12	Very cobbly loam	GM, GM-GC	A-4	40-65	65-75	65-75	55-70	40-50	25-30	25-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
41*. Orthents											
42---------- Paymaster	0-10	Gravelly sandy loam.	GM, SM	A-1, A-2	0	55-80	50-75	35-60	20-35	---	NP
	10-60	Fine sandy loam, very fine sandy loam, sandy loam.	SM, ML	A-2, A-4	0	90-100	90-100	55-95	25-65	---	NP
43*:											
Paymaster-------	0-14	Sandy loam-------	SM	A-2, A-4	0	90-100	90-100	60-85	30-50	---	NP
	14-60	Fine sandy loam, loam, sandy loam.	SM, ML	A-2, A-4	0	90-100	90-100	55-95	25-65	---	NP
Ellicott--------	0-8	Gravelly sand----	GP-GM, GM, SP-SM, SM	A-1	0	50-80	50-75	30-50	5-20	---	NP
	8-60	Stratified coarse sand to sandy loam.	SP-SM, SM	A-1	0-5	90-100	75-95	30-50	5-15	---	NP
44*:											
Paymaster-------	0-10	Fine sandy loam	SM	A-2, A-4	0	90-100	90-100	60-85	30-50	---	NP
	10-55	Fine sandy loam, very fine sandy loam, sandy loam.	SM, ML	A-2, A-4	0	90-100	90-100	55-95	25-65	---	NP
	55-60	Extremely gravelly loamy sand.	GP	A-1	20-35	30-40	20-35	15-25	0-5	---	NP
Ellicott--------	0-6	Gravelly sand----	GP-GM, GM, SP-SM, SM	A-1	0	50-80	50-75	30-50	5-20	---	NP
	6-60	Stratified coarse sand to sandy loam.	SP-SM, SM	A-1	0-5	90-100	75-95	30-50	5-15	---	NP
45*:											
Paymaster-------	0-5	Fine sandy loam	SM	A-2, A-4	0	90-100	90-100	60-85	30-50	---	NP
	5-60	Fine sandy loam, very fine sandy loam, sandy loam.	SM, ML	A-2, A-4	0	90-100	90-100	55-95	25-65	---	NP

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
45*:											
Ellicott	0-6	Gravelly sand	GP-GM, GM, SP-SM, SM	A-1	0	50-80	50-75	30-50	5-20	---	NP
	6-60	Stratified coarse sand to sandy loam.	SP-SM, SM	A-1	0-5	90-100	75-95	30-50	5-15	---	NP
Manzano	0-3	Loam	CL-ML	A-4	0	100	100	85-100	60-80	20-30	5-10
	3-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-15
46*:											
Pits.											
Dumps.											
47	0-2	Gravelly loam	SM-SC, SM, ML, GM-GC GM	A-4	0-5	60-80	50-75	45-65	35-50	20-35	5-10
Plack											
	2-17	Loam	CL-ML, ML	A-4	0-5	80-100	75-90	60-75	50-65	25-35	5-10
	17	Indurated	---	---	---	---	---	---	---	---	---
48*:											
Plack Variant	0-5	Gravelly loam	SM-SC, SM, GM-GC, GM	A-4	0	60-80	50-75	45-65	35-50	25-35	5-10
	5-11	Gravelly silt loam, gravelly clay loam, gravelly loam.	GM-GC, GC, CL-ML, CL	A-4, A-6	0	60-80	50-75	45-70	35-60	25-35	5-15
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Guy	0-10	Gravelly loam	SM	A-2, A-4, A-1	0-10	70-100	60-70	40-60	20-50	25-35	NP-10
	10-40	Gravelly sandy loam, sandy loam, gravelly loam.	SM	A-1, A-2, A-4	0-25	70-100	65-95	40-70	20-50	20-30	NP-5
	40-60	Very gravelly loamy sand, gravelly loamy sand.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-25	45-85	40-75	20-60	10-25	---	NP
49*:											
Plack Variant	0-5	Gravelly loam	SM-SC, SM, GM-GC, GM	A-4	0	60-80	50-75	45-65	35-50	25-35	5-10
	5-10	Gravelly silt loam, gravelly clay loam, gravelly loam.	GM-GC, GC, CL-ML, CL	A-4, A-6	0	60-80	50-75	45-70	35-60	25-35	5-15
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Guy	0-8	Very cobbly loam	SM	A-2, A-4, A-1	0-50	70-100	60-70	40-60	20-50	20-35	NP-10
	8-40	Gravelly sandy loam, sandy loam, gravelly loam.	SM	A-1, A-2, A-4	0-25	70-100	65-95	40-70	20-50	20-30	NP-5
	40-60	Very gravelly loamy sand, gravelly loamy sand.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-25	45-85	40-75	20-60	10-25	---	NP
50*.											
Riverwash											

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
51*:											
Rock outcrop.											
Graham----------	0-1	Clay loam--------	CL	A-6	0-5	85-95	80-90	70-90	55-75	30-40	10-15
	1-13	Clay-------------	CH	A-7	0-5	100	90-100	85-95	70-90	60-80	40-60
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
52*:											
Rock outcrop.											
Lithic Ustorthents.											
53*:											
Rock outcrop.											
Luzena----------	0-3	Gravelly clay loam.	SC, SM-SC, GC, GM-GC	A-4, A-6	0-15	70-85	70-80	60-70	40-50	25-40	5-20
	3-10	Gravelly clay, clay, gravelly clay loam.	CL, CH	A-7	5-20	70-100	65-95	55-80	50-75	45-55	25-35
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
54*:											
Rock outcrop.											
Muzzler---------	0-5	Cobbly loam------	CL	A-6	30-50	95-100	90-100	80-95	60-75	30-40	10-20
	5-13	Very cobbly clay, very cobbly clay loam.	CL, CH	A-7	55-90	95-100	90-100	80-95	65-80	45-55	20-30
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
55----------	0-3	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	85-95	35-45	15-25
Ruidoso	3-60	Clay loam, clay	CH, CL	A-6, A-7	0	100	100	90-100	70-95	35-65	15-35
56*:											
Ruidoso---------	0-11	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	85-95	35-45	15-25
	11-60	Clay loam, clay	CH, CL	A-6, A-7	0	100	100	90-100	70-95	35-65	15-35
Muzzler---------	0-2	Cobbly loam------	CL	A-6	30-50	95-100	90-100	80-95	60-75	30-40	10-20
	2-8	Very cobbly clay, very cobbly clay loam.	CL, CH	A-7	55-90	95-100	90-100	80-95	65-80	45-55	20-30
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
57*:											
Sampson---------	0-1	Loamy sand-------	SM	A-2	0	90-100	90-100	50-60	15-25	---	NP
	1-45	Clay loam, loam, sandy clay loam.	CL, SC	A-6	0	95-100	90-100	75-90	40-75	25-40	10-20
	45-60	Loam, sandy loam, sandy clay loam.	CL-ML, SM-SC	A-4	0	90-100	75-100	60-90	35-70	20-30	5-10
Dagflat---------	0-8	Loam-------------	CL-ML	A-4	0	85-100	80-100	70-90	50-65	20-30	5-10
	8-31	Gravelly sandy clay loam, sandy clay loam.	SM-SC	A-2, A-4	0	100	75-100	65-85	30-50	25-30	5-10
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
58*:											
Sanloren--------	0-10	Loam----------	CL-ML, CL	A-4, A-6	0	100	100	85-95	60-75	25-35	5-15
	10-20	Clay loam--------	CL	A-7	0	100	100	90-100	70-80	40-50	15-25
	20-37	Very cobbly clay, very cobbly clay loam.	CL, CH	A-7	50-70	90-100	85-95	80-90	65-80	45-55	20-30
	37-60	Very cobbly sandy loam, very cobbly sandy clay loam, very gravelly sandy clay.	SC, GC, SM-SC, GM-GC	A-6, A-2	30-70	55-100	50-95	40-85	20-50	25-40	5-20
Majada Variant--	0-11	Cobbly loam------	CL-ML	A-4	25-40	85-95	80-90	70-85	50-65	20-30	5-10
	11-60	Very cobbly loam, very cobbly clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	40-70	70-90	65-85	55-80	40-65	25-35	5-15
59*:											
Santa Fe--------	0-2	Gravelly sandy loam.	GM, SM	A-1, A-2	0-10	55-80	50-75	30-50	15-30	20-25	NP-5
	2-18	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-10	35-55	30-50	25-45	20-35	25-35	10-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
60*:											
Santa Fe--------	0-2	Gravelly sandy loam.	GM, SM	A-1, A-2	0-10	55-80	50-75	30-50	15-30	20-25	NP-5
	2-16	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-10	35-55	30-50	25-45	20-35	25-35	10-15
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
61*:											
Santa Fe--------	0-4	Gravelly sandy loam.	GM, SM	A-1, A-2	0-10	55-80	50-75	30-50	15-30	20-25	NP-5
	4-14	Very gravelly loam, very gravelly clay loam.	GC	A-2	0-10	35-55	30-50	25-45	20-35	25-35	10-15
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
62----------	0-6	Loamy sand-------	SM	A-2	0-10	95-100	95-100	50-75	20-30	---	NP
Santana	6-13	Gravelly loam, sandy clay loam, loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	70-85	65-85	50-70	35-55	25-35	5-15
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
63*:											
Santana---------	0-8	Loam----------	CL-ML	A-4	0-10	95-100	95-100	80-95	60-70	20-30	5-10
	8-12	Gravelly loam, sandy clay loam, loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	70-85	65-85	50-70	35-55	25-35	5-15
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
64*:											
Santana	0-4	Sandy loam	SM	A-2, A-4	0	95-100	95-100	60-70	30-40	20-25	NP-5
	4-14	Gravelly loam, sandy clay loam, loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	70-85	65-85	50-70	35-55	25-35	5-15
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
65*:											
Stellar	0-8	Sandy clay loam	SC, SM-SC, CL-ML, CL	A-6, A-4	0	100	100	85-95	40-60	20-35	5-15
	8-35	Clay, sandy clay, clay loam.	CH, CL, SC	A-7	0	100	100	80-95	45-90	40-60	15-30
	35-60	Clay loam, sandy clay loam, gravelly clay loam.	CL, GC, SC	A-6, A-7	0-5	65-100	60-100	55-100	45-70	30-50	10-25
Mohave	0-3	Sandy clay loam	CL	A-6	0	90-100	85-95	70-85	50-70	30-40	10-20
	3-39	Clay loam	CL	A-4, A-6	0	100	95-100	85-95	70-80	30-40	10-15
	39-60	Sandy loam, sandy clay loam.	SM-SC	A-4	0	100	100	65-85	35-50	20-30	5-10
66*:											
Stellar	0-6	Silty clay loam	CL	A-6	0	100	100	90-100	70-95	30-40	10-20
	6-26	Clay, sandy clay, clay loam.	CH, CL, SC	A-7	0	100	100	80-95	45-90	40-60	15-30
	26-60	Clay loam, sandy clay loam, gravelly clay loam.	CL, GC, SC	A-6, A-7	0-5	65-100	60-100	55-100	45-70	30-50	10-25
Verhalen	0-10	Clay	CL, CH	A-7-6	0	95-100	95-100	90-100	70-95	45-65	25-40
	10-60	Clay, silty clay, clay loam.	CL, CH	A-7-6	0	95-100	95-100	90-100	70-95	45-65	25-40
Mimbres	0-6	Silty clay loam	CL-ML, CL	A-4, A-6, A-7	0	100	100	95-100	70-95	20-45	5-25
	6-60	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	100	100	95-100	75-95	25-45	10-25
67	0-2	Silty clay loam	CL, CH	A-7	0	100	100	95-100	75-95	40-60	20-40
Stirk Variant	2-60	Clay, silty clay.	CH, MH	A-7	0	100	100	95-100	85-100	55-80	25-45
68	0-3	Very gravelly loam.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-5	50-90	15-50	10-40	5-30	20-25	NP-5
Tesajo	3-60	Very gravelly sandy loam, very gravelly loam.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-5	50-90	15-50	10-40	5-30	20-25	NP-5
69*:											
Tesajo	0-9	Gravelly sandy loam.	SM	A-1, A-2	0-5	75-85	50-60	30-50	15-35	20-25	NP-5
	9-60	Very cobbly sandy clay loam.	SM-SC	A-4	50-65	65-90	60-80	55-70	35-40	20-30	5-10
Manzano	0-11	Gravelly sandy clay loam.	GC, SC, GM-GC, SM-SC	A-2, A-4	0-5	55-80	50-75	45-70	25-50	25-35	5-15
	11-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-15

See footnote at end of table.

TABLE 10.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
70---------- Tres Hermanos	0-4	Gravelly sandy clay loam.	GC, SC, GM-GC, SM-SC	A-4, A-2	0-5	55-80	50-75	45-70	25-50	25-35	5-15
	4-14	Gravelly sandy clay loam, gravelly clay loam, clay loam.	CL-ML, SC, GC, SM-SC	A-4, A-6	0-10	55-80	50-75	45-70	35-55	25-35	5-15
	14-60	Gravelly loam, gravelly sandy clay loam, gravelly sandy loam.	SM-SC, GM-GC	A-4, A-2	0-10	55-80	50-75	35-65	20-50	25-30	5-10
71*: Tres Hermanos---	0-3	Gravelly sandy clay loam.	GC, SC, GM-GC, SM-SC	A-4, A-2	0-5	55-80	50-75	45-70	25-50	25-35	5-15
	3-13	Gravelly sandy clay loam, gravelly clay loam, clay loam.	CL-ML, SC, GC, SM-SC	A-4, A-6	0-10	55-80	50-75	45-70	35-55	25-35	5-15
	13-60	Gravelly loam, gravelly sandy clay loam, gravelly sandy loam.	SM-SC, GM-GC	A-4, A-2	0-10	55-80	50-75	35-65	20-50	25-30	5-10
Lehmans---------	0-3	Gravelly sandy clay loam.	GM, SM	A-2	0-15	60-80	55-75	40-65	20-35	30-40	5-15
	3-17	Clay, gravelly clay, gravelly clay loam.	CH, SC	A-7	0-5	75-100	55-80	50-75	40-65	50-60	30-40
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
72*: Tres Hermanos---	0-2	Fine sandy loam	SM	A-4, A-2	0	95-100	90-100	60-80	30-50	20-25	NP-5
	2-18	Gravelly sandy clay loam, gravelly clay loam, clay loam.	CL-ML, SC, GC, SM-SC	A-4, A-6	0-10	55-80	50-75	45-70	35-55	25-35	5-15
	18-60	Gravelly loam, gravelly sandy clay loam, gravelly sandy loam.	SM-SC, GM-GC	A-4, A-2	0-10	55-80	50-75	35-65	20-50	25-30	5-10
Upton----------	0-3	Gravelly loam----	CL, GC, SC	A-4, A-6	0-5	65-85	60-75	50-70	35-55	20-30	10-20
	3-14	Gravelly clay loam, very gravelly clay loam.	GC, SC	A-2, A-6	0-5	50-70	40-60	30-50	20-40	25-35	15-25
	14-25	Cemented---------	---	---	0-50	---	---	---	---	---	---
	25-60	Variable---------	---	---	0-20	---	---	---	---	---	---
73*: White House-----	0-3	Sandy clay loam	CL, SC	A-6	0-10	80-95	75-90	55-75	40-70	25-40	15-25
	3-20	Clay, clay loam	CH	A-7	0-5	90-100	80-95	70-90	60-90	50-60	30-40
	20-25	Very gravelly sandy clay loam.	GC, GM-GC	A-2	0-10	40-55	35-50	30-45	10-30	25-35	5-15
	25-60	Clay, sandy clay, gravelly sandy clay.	SC, CL	A-6	0-5	70-100	60-90	50-80	35-55	25-40	15-25
Ruidoso---------	0-10	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	85-95	35-45	15-25
	10-60	Clay loam, clay	CH, CL	A-6, A-7	0	100	100	90-100	70-95	35-65	15-35

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
1*:											
Abrazo	0-4	30-40	0.2-0.6	0.14-0.16	6.6-7.3	<2	Moderate	0.28	2	8	1-2
	4-24	35-55	0.06-0.2	0.14-0.16	7.4-8.4	<2	High	0.24			
	24-28	40-55	0.06-0.2	0.14-0.16	7.4-8.4	<2	High	0.24			
	28	---	---	---	---	---	---	---			
Luzena	0-3	20-27	0.6-2.0	0.12-0.14	6.1-7.3	<2	Low	0.05	1	7	1-2
	3-12	45-60	0.06-0.2	0.10-0.14	6.1-7.8	<2	High	0.17			
	12	---	---	---	---	---	---	---			
2*:											
Abrazo	0-2	30-40	0.2-0.6	0.14-0.16	6.6-7.3	<2	Moderate	0.28	2	8	1-2
	2-27	35-55	0.06-0.2	0.14-0.16	7.4-8.4	<2	High	0.24			
	27	---	---	---	---	---	---	---			
Luzena	0-1	28-35	0.6-2.0	0.11-0.12	6.1-7.3	<2	Moderate	0.17	1	7	1-2
	1-14	45-60	0.06-0.2	0.10-0.14	6.1-7.8	<2	High	0.17			
	14	---	---	---	---	---	---	---			
3	0-4	5-20	2.0-6.0	0.11-0.14	7.4-8.4	<4	Low	0.24	5	3	.2-.6
Anthony	4-60	5-18	2.0-6.0	0.10-0.13	7.4-8.4	<4	Low	0.28			
4	0-2	27-35	0.2-0.6	0.14-0.16	6.1-8.4	<2	Moderate	0.15	1	6	1-2
Boysag	2-14	35-45	0.06-0.2	0.14-0.19	7.4-8.4	<2	High	0.17			
	14	---	---	---	---	---	---	---			
5*:											
Boysag	0-3	25-35	0.2-0.6	0.14-0.16	6.1-8.4	<2	Moderate	0.15	1	6	1-2
	3-18	35-45	0.06-0.2	0.14-0.19	7.4-8.4	<2	High	0.17			
	18	---	---	---	---	---	---	---			
Abrazo	0-10	8-20	2.0-6.0	0.11-0.13	6.6-7.3	<2	Low	0.24	2	3	1-2
	10-25	35-55	0.06-0.2	0.14-0.16	7.4-8.4	<2	High	0.24			
	25	---	---	---	---	---	---	---			
Santana	0-4	8-18	2.0-6.0	0.12-0.15	6.1-7.8	<2	Low	0.32	1	3	1-2
	4-14	15-30	0.6-2.0	0.12-0.15	6.1-7.8	<2	Low	0.32			
	14	---	---	---	---	---	---	---			
6*:											
Bucklebar	0-3	10-20	2.0-6.0	0.08-0.13	7.4-8.4	<2	Low	0.24	5	3	.4-.8
	3-60	20-35	0.6-2.0	0.13-0.17	7.4-8.4	<2	Moderate	0.32			
Sonoita	0-4	5-8	2.0-6.0	0.05-0.08	6.1-7.3	<2	Low	0.24	5	2	<.-1
	4-60	10-18	2.0-6.0	0.07-0.13	6.6-8.4	<2	Low	0.24			
Continental	0-7	10-20	0.6-2.0	0.11-0.13	6.1-7.3	<2	Low	0.24	5	3	.5-1
	7-39	35-50	0.06-0.2	0.10-0.14	6.6-8.4	<2	High	0.15			
	39-60	25-35	0.2-0.6	0.10-0.14	6.6-8.4	<2	Moderate	0.32			
7*:											
Carnero	0-3	10-20	2.0-6.0	0.11-0.14	6.6-7.8	<2	Low	0.28	2	3	1-2
	3-34	35-50	0.06-0.2	0.13-0.20	6.6-8.4	<2	High	0.24			
	34	---	---	---	---	---	---	---			
Santa Fe	0-3	8-15	2.0-6.0	0.11-0.13	6.1-7.8	<2	Low	0.20	1	4	---
	3-18	15-35	0.6-2.0	0.07-0.09	6.6-7.8	<2	Low	0.17			
	18	---	---	---	---	---	---	---			
8	0-2	18-26	0.6-2.0	0.10-0.18	7.9-9.0	<2	Low	0.32	1	5	1-2
Conger	2-13	30-35	0.6-2.0	0.10-0.18	7.9-9.0	<2	Low	0.37			
	13-39	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 11.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
9*:											
Conger----------	0-1	10-20	2.0-6.0	0.11-0.14	7.9-8.4	<2	Low-------	0.28	1	3	1-2
	1-10	20-30	0.6-2.0	0.14-0.16	7.9-9.0	<2	Moderate	0.32			
	10-39	---	---	---	---	---	----------	---			
Stellar----------	0-6	20-27	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.28	5	5	1-2
	6-60	35-50	0.06-0.2	0.14-0.16	7.4-8.4	2-4	High------	0.28			
10*:											
Continental-----	0-5	20-35	0.6-2.0	0.14-0.16	6.1-7.3	<2	Moderate	0.32	5	5	.5-1
	5-24	35-50	0.06-0.2	0.19-0.21	6.6-8.4	<2	High------	0.32			
	24-60	15-35	0.6-2.0	0.07-0.09	7.4-8.4	<2	Low-------	0.10			
Nickel----------	0-8	5-10	2.0-6.0	0.06-0.09	7.9-8.4	<2	Low-------	0.20	5	3	<.5
	8-19	5-10	0.2-0.6	0.04-0.07	7.9-8.4	<2	Low-------	0.17			
	19-60	5-10	0.2-0.6	0.04-0.07	7.9-8.4	<2	Low-------	0.15			
11*:											
Dagflat---------	0-8	15-25	0.6-2.0	0.16-0.18	6.1-7.3	<2	Low-------	0.37	2	5	1-2
	8-31	18-30	0.6-2.0	0.12-0.16	6.1-7.8	<2	Low-------	0.24			
	31	---	---	---	---	---	----------	---			
Santa Fe---------	0-2	8-15	2.0-6.0	0.11-0.13	6.1-7.8	<2	Low-------	0.20	1	4	---
	2-18	15-35	0.6-2.0	0.07-0.09	6.6-7.8	<2	Low-------	0.17			
	18	---	---	---	---	---	----------	---			
12*, 13*:											
Encierro---------	0-2	18-26	0.6-2.0	0.13-0.15	6.6-7.8	<2	Low-------	0.32	1	5	---
	2-9	35-50	0.06-0.2	0.14-0.16	6.1-8.4	<2	High------	0.20			
	9	---	---	---	---	---	----------	---			
Rock outcrop.											
14*:											
Gaddes----------	0-2	10-15	2.0-6.0	0.07-0.10	6.1-7.3	<2	Low-------	0.15	2	4	1-3
	2-22	25-35	0.2-0.6	0.08-0.13	6.1-7.3	<2	Moderate	0.10			
	22	---	---	---	---	---	----------	---			
Ruidoso---------	0-3	30-40	0.2-0.6	0.15-0.21	6.6-7.8	<2	Moderate	0.28	5	6	---
	3-60	35-45	0.06-0.2	0.14-0.19	6.6-8.4	<2	Moderate	0.28			
15*:											
Gaddes----------	0-2	10-15	2.0-6.0	0.07-0.10	6.1-7.3	<2	Low-------	0.15	2	3	1-3
	2-22	25-35	0.2-0.6	0.08-0.13	6.1-7.3	<2	Moderate	0.10			
	22	---	---	---	---	---	----------	---			
Santa Fe---------	0-2	8-15	2.0-6.0	0.11-0.13	6.1-7.8	<2	Low-------	0.20	1	4	---
	2-18	15-35	0.6-2.0	0.07-0.09	6.6-7.8	<2	Low-------	0.17			
	18	---	---	---	---	---	----------	---			
Rock outcrop.											
16----------	0-8	10-20	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low-------	0.28	5	3	.5-1
Gila Variant	8-14	18-27	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low-------	0.37			
	14-60	18-35	0.6-2.0	0.14-0.18	7.4-8.4	<2	Low-------	0.32			
17----------	0-8	8-17	2.0-6.0	0.07-0.14	7.9-8.4	<2	Low-------	0.24	2	8	---
Guy	8-31	5-17	2.0-6.0	0.08-0.12	7.9-8.4	<2	Low-------	0.24			
	31-60	3-0	2.0-6.0	0.03-0.07	7.9-8.4	<2	Low-------	0.15			
18*:											
Guy----------	0-8	8-17	2.0-6.0	0.09-0.14	7.9-8.4	<2	Low-------	0.24	2	5	---
	8-60	5-17	2.0-6.0	0.08-0.12	7.9-8.4	<2	Low-------	0.24			
Lonti----------	0-6	25-35	0.2-0.6	0.12-0.16	6.1-8.4	<2	Moderate	0.15	5	6	1-2
	6-25	40-50	0.06-0.2	0.19-0.21	6.6-8.4	<2	High------	0.20			
	25-60	20-30	0.6-2.0	0.09-0.11	7.9-8.4	<2	Moderate	0.28			

See footnote at end of table.

TABLE 11.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
19----------	0-2	27-35	0.2-0.6	0.16-0.19	7.4-9.0	<8	Moderate	0.28	5	4L	.5-2
Haverson	2-60	18-35	0.6-2.0	0.14-0.18	7.4-9.0	<8	Low--------	0.24			
20*:											
Hondale---------	0-5	10-20	2.0-6.0	0.04-0.08	7.9-9.0	4-16	Low--------	0.24	5	2	---
	5-28	35-45	<0.06	0.08-0.15	8.5-9.0	4-16	High-------	0.37			
	28-60	30-40	0.2-0.6	0.08-0.15	8.5-9.0	4-16	Moderate	0.37			
Verhalen--------	0-10	40-60	<0.06	0.12-0.17	7.4-8.4	0-4	High-------	0.32	5	4	1-2
	10-60	35-60	<0.06	0.12-0.17	7.4-8.4	0-16	High-------	0.32			
21----------	0-10	20-30	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low--------	0.32	5	5	1-2
Jonale	10-60	18-30	0.6-2.0	0.14-0.18	7.9-8.4	<2	Low--------	0.32			
22*:											
Judd----------	0-2	15-25	0.6-2.0	0.16-0.18	6.6-7.3	<2	Low--------	0.37	5	5	1-2
	2-18	35-50	0.06-0.2	0.14-0.19	6.6-7.8	<2	Moderate	0.24			
	18-60	20-35	0.2-0.6	0.16-0.21	7.9-9.0	<2	Low--------	0.32			
Manzano---------	0-15	18-26	0.6-2.0	0.13-0.15	6.6-8.4	<2	Low--------	0.32	5	6	2-3
	15-35	18-34	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.32			
	35-60	10-20	2.0-6.0	0.11-0.13	7.4-8.4		Low--------	0.24			
23*:											
Lehmans---------	0-1	20-35	0.6-2.0	0.10-0.12	6.6-8.4	<2	Moderate	0.15	1	6	.5-1
	1-15	35-55	0.06-0.2	0.10-0.15	6.6-8.4	<2	High-------	0.10			
	15	---	---	---	---	---	----------	----			
Lithic Haplargids.											
24*: Lithic Haplargids.											
Rock outcrop.											
25----------	0-4	15-25	0.2-0.6	0.12-0.16	6.1-8.4	<2	Low--------	0.17	5	6	1-2
Lonti	4-23	35-50	0.06-0.2	0.12-0.16	6.6-8.4	<2	High-------	0.15			
	23-60	20-35	0.2-0.6	0.10-0.12	7.9-8.4	<2	Moderate	0.28			
26----------	0-4	30-40	0.2-0.6	0.13-0.15	6.6-7.8	<2	Moderate	0.28	5	7	1-2
Lonti	4-22	45-65	0.06-0.2	0.14-0.16	6.6-8.4	<2	High-------	0.20			
	22-60	10-20	0.6-2.0	0.09-0.11	7.9-8.4	<2	Moderate	0.28			
27*:											
Lonti----------	0-4	15-25	0.2-0.6	0.12-0.16	6.1-8.4	<2	Low--------	0.17	5	6	1-2
	4-23	35-50	0.06-0.2	0.12-0.16	6.6-8.4	<2	High-------	0.15			
	23-60	20-30	0.2-0.6	0.05-0.10	7.9-8.4	<2	Moderate	0.05			
Denver Variant--	0-2	28-35	0.2-0.6	0.19-0.21	6.6-7.3	<2	Low--------	0.37	5	6	1-2
	2-30	40-60	<0.06	0.14-0.16	7.4-8.4	<2	High-------	0.20			
	30-60	40-60	<0.06	0.10-0.12	7.4-8.4	<2	High-------	0.17			
28*:											
Lonti----------	0-4	15-25	0.2-0.6	0.12-0.16	6.1-8.4	<2	Low--------	0.17	5	6	1-2
	4-34	45-65	0.06-0.2	0.14-0.16	6.6-8.4	<2	High-------	0.20			
	34-60	20-30	0.2-0.6	0.05-0.10	7.9-8.4	<2	Moderate	0.05			
Manzano---------	0-15	10-25	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low--------	0.28	5	6	2-3
	15-60	18-34	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.32			
29*:											
Lonti----------	0-4	15-25	0.2-0.6	0.12-0.16	6.1-8.4	<2	Low--------	0.17	5	6	1-2
	4-29	35-50	0.06-0.2	0.12-0.16	6.6-8.4	<2	High-------	0.15			
	29-60	18-35	0.6-2.0	0.09-0.11	7.9-8.4	<2	Moderate	0.28			
Ustorthents.											

See footnote at end of table.

TABLE 11.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
30----------	0-4	25-30	0.6-2.0	0.08-0.12	6.1-7.3	<2	Moderate	0.05	1	8	1-2
Luzena	4-15	45-60	0.06-0.2	0.10-0.14	6.1-7.8	<2	High------	0.17			
	15	---	---	---	---	---	----------	----			
31*:											
Luzena----------	0-2	20-25	0.6-2.0	0.11-0.12	6.1-7.3	<2	Moderate	0.17	1	7	1-2
	2-16	45-60	0.06-0.2	0.10-0.14	6.1-7.8	<2	High------	0.17			
	16	---	---	---	---	---	----------	----			
Rock outcrop.											
32----------	0-3	10-25	0.2-2.0	0.16-0.18	6.6-8.4	<2	Low-------	0.28	5	6	2-3
Manzano	3-60	18-34	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.32			
33----------	0-3	10-25	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low-------	0.28	5	6	2-3
Manzano	3-60	18-34	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.32			
34*:											
Manzano---------	0-20	10-25	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low-------	0.28	5	6	2-3
	20-60	18-34	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.32			
Ruidoso---------	0-10	30-40	0.06-0.6	0.15-0.21	6.6-7.8	<2	Moderate	0.28	5	7	---
	10-60	30-45	0.06-0.2	0.14-0.19	6.6-8.4	<2	Moderate	0.28			
35*:											
Mimbres---------	0-6	18-27	0.6-2.0	0.13-0.19	7.4-8.4	<4	Moderate	0.43	5	6	.5-1
	6-60	18-35	0.2-0.6	0.16-0.21	7.4-8.4	<4	Moderate	0.43			
Arizo-----------	0-18	0-5	2.0-6.0	0.09-0.11	6.6-7.8	<2	Low-------	0.17	5	2	<.5
	18-60	0-5	>20	0.01-0.04	7.4-9.0	<2	Low-------	0.10			
Riverwash.											
36----------	0-3	27-35	0.2-0.6	0.05-0.07	6.6-7.3	<2	Moderate	0.17	1	8	---
Muzzler	3-12	35-55	0.06-0.2	0.06-0.08	6.6-7.3	<2	Moderate	0.17			
	12	---	---	---	---	---	----------	----			
37*:											
Muzzler---------	0-2	10-20	2.0-6.0	0.07-0.09	6.6-7.3	<2	Low-------	0.20	1	4	---
	2-19	35-55	0.06-0.2	0.06-0.08	6.6-7.3	<2	Moderate	0.17			
	19	---	---	---	---	---	----------	----			
Rock outcrop.											
38*:											
Nickel----------	0-6	5-10	2.0-6.0	0.06-0.09	7.9-8.4	<2	Low-------	0.20	4	---	<.5
	6-19	5-10	0.6-2.0	0.04-0.07	7.9-8.4	<2	Low-------	0.17			
	19-60	5-10	0.2-6.0	0.04-0.07	7.9-8.4	<2	Low-------	0.15			
Upton-----------	0-3	15-27	0.6-2.0	0.08-0.14	7.9-8.4	<2	Low-------	0.28	2	7	<1
	3-13	30-35	0.6-2.0	0.05-0.08	7.9-8.4	<2	Low-------	0.32			
	13-20	---	---	---	7.9-8.4	<2	Very low	----			
	20-60	---	---	---	---	---	----------	----			
39*:											
Oro Grande------	0-13	18-27	0.6-2.0	0.06-0.09	6.6-8.4	<2	Low-------	0.32	1	8	---
	13	---	---	---	---	---	----------	----			
Rock outcrop.											
40*:											
Oro Grande------	0-12	18-27	0.6-2.0	0.06-0.09	6.6-8.4	<2	Low-------	0.32	1	8	---
	12	---	---	---	---	---	----------	----			
Rock outcrop.											
41*.											
Orthents											

See footnote at end of table.

TABLE 11.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
42----------	0-10	5-18	2.0-6.0	0.08-0.10	7.4-7.8	<2	Low--------	0.24	5	4	3-4
Paymaster	10-60	5-18	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low--------	0.28			
43*:											
Paymaster-------	0-14	5-18	2.0-6.0	0.11-0.15	7.4-7.8	<2	Low--------	0.28	4	3	3-4
	14-60	5-18	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low--------	0.28			
Ellicott--------	0-8	0-5	6.0-20	0.04-0.06	6.1-7.8	<2	Low--------	0.10	5	2	.5-1
	8-60	0-10	6.0-20	0.05-0.08	6.1-7.8	<2	Low--------	0.10			
44*:											
Paymaster-------	0-10	5-18	2.0-6.0	0.11-0.15	7.4-7.8	<2	Low--------	0.28	4	3	3-4
	10-55	5-18	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low--------	0.28			
	55-60	0-5	6.0-20.0	0.03-0.05	7.4-8.4	<2	Low--------	0.10			
Ellicott--------	0-6	0-5	6.0-20	0.04-0.06	6.1-7.8	<2	Low--------	0.10	5	2	.5-1
	6-60	0-10	6.0-20	0.05-0.08	6.1-7.8	<2	Low--------	0.10			
45*:											
Paymaster-------	0-5	5-18	2.0-6.0	0.11-0.15	7.4-7.8	<2	Low--------	0.28	4	3	3-4
	5-60	5-18	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low--------	0.28			
Ellicott--------	0-6	0-5	6.0-20	0.04-0.06	6.1-7.8	<2	Low--------	0.10	5	2	.5-1
	6-60	0-10	6.0-20	0.05-0.08	6.1-7.8	<2	Low--------	0.10			
Manzano---------	0-3	10-25	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low--------	0.28	5	6	2-3
	3-60	18-34	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.32			
46*:											
Pits.											
Dumps.											
47----------	0-17	15-26	0.6-2.0	0.10-0.18	7.9-8.4	<2	Low--------	0.32	1	4L	1-3
Plack	17	---	---	---	---	---	----------	----			
48*:											
Plack Variant---	0-5	15-25	0.6-2.0	0.12-0.14	7.9-8.4	<2	Low--------	0.32	1	5	1-2
	5-11	15-30	0.6-2.0	0.12-0.15	7.9-8.4	<2	Low--------	0.37			
	11	---	---	---	---	---	----------	----			
Guy----------	0-10	8-17	2.0-6.0	0.09-0.14	7.9-8.4	<2	Low--------	0.24	2	5	---
	10-40	5-17	2.0-6.0	0.08-0.12	7.9-8.4	<2	Low--------	0.24			
	40-60	4-14	6.0-20	0.05-0.08	7.9-8.4	<2	Low--------	0.15			
49*:											
Plack Variant---	0-5	15-25	0.6-2.0	0.12-0.14	7.9-8.4	<2	Low--------	0.32	1	5	1-2
	5-10	15-30	0.6-2.0	0.12-0.15	7.9-8.4	<2	Low--------	0.37			
	10	---	---	---	---	---	----------	----			
Guy----------	0-8	8-17	2.0-6.0	0.07-0.14	7.9-8.4	<2	Low--------	0.24	2	8	---
	8-40	5-17	2.0-6.0	0.08-0.12	7.9-8.4	<2	Low--------	0.24			
	40-60	4-14	6.0-20	0.05-0.08	7.9-8.4	<2	Low--------	0.15			
50*.											
Riverwash											
51*:											
Rock outcrop.											
Graham----------	0-1	27-35	0.2-0.6	0.17-0.19	6.6-7.8	<2	Moderate	0.32	1	6	1-3
	1-13	40-55	0.06-0.2	0.19-0.21	7,4-8.4	<2	High-------	0.20			
	13	---	---	---	---	---	----------	----			
52*:											
Rock outcrop.											
Lithic Ustorthents.											

See footnote at end of table.

TABLE 11.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
53*:											
Rock outcrop.											
Luzena----------	0-3	28-35	0.6-2.0	0.11-0.12	6.1-7.3	<2	Moderate	0.17	1	7	1-2
	3-10	38-60	0.06-0.2	0.10-0.14	6.1-7.8	<2	High------	0.17			
	10	---	---	---	---	---	----------	----			
54*:											
Rock outcrop.											
Muzzler---------	0-5	25-27	0.2-0.6	0.08-0.10	6.6-7.3	<2	Low-------	0.28	1	7	---
	5-13	35-55	0.06-0.2	0.06-0.08	6.6-7.3	<2	Moderate	0.17			
	13	---	---	---	---	---	----------	----			
55----------	0-3	30-40	0.06-0.6	0.15-0.21	6.6-7.8	<2	Moderate	0.28	5	7	---
Ruidoso	3-60	30-45	0.06-0.2	0.14-0.19	6.6-8.4	<2	Moderate	0.28			
56*:											
Ruidoso---------	0-11	30-40	0.06-0.6	0.15-0.21	6.6-7.8	<2	Moderate	0.28	5	7	---
	11-60	30-45	0.06-0.2	0.14-0.19	6.6-8.4	<2	Moderate	0.28			
Muzzler---------	0-2	25-27	0.2-0.6	0.08-0.10	6.6-7.3	<2	Low-------	0.28	1	7	---
	2-8	35-55	0.06-0.2	0.06-0.08	6.6-7.3	<2	Moderate	0.17			
	8	---	---	---	---	---	----------	----			
57*:											
Sampson---------	0-1	3-8	>6.0	0.07-0.09	6.6-7.3	<2	Low-------	0.17	5	2	2-3
	1-45	18-35	0.6-2.0	0.15-0.20	7.4-8.4	<2	Moderate	0.24			
	45-60	18-35	0.6-2.0	0.13-0.17	7.4-8.4	<2	Low-------	0.24			
Dagflat---------	0-8	15-25	0.6-2.0	0.16-0.18	6.1-7.3	<2	Low-------	0.37	2	5	1-2
	8-31	18-30	0.6-2.0	0.12-0.16	6.1-7.8	<2	Low-------	0.24			
	31	---	---	---	---	---	----------	----			
58*:											
Sanloren--------	0-10	15-25	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low-------	0.37	5	5	---
	10-20	35-40	0.2-0.6	0.18-0.20	7.4-7.8	<2	Moderate	0.32			
	20-37	35-50	0.2-0.6	0.06-0.08	7.4-7.8	<2	Moderate	0.24			
	37-60	18-40	0.6-2.0	0.05-0.07	7.4-7.8	<2	Low-------	0.24			
Majada Variant--	0-11	15-25	0.6-2.0	0.12-0.14	6.6-7.3	<2	Low-------	0.32	5	6	1-2
	11-60	20-35	0.2-0.6	0.08-0.10	6.6-7.8	<2	Moderate	0.28			
59*:											
Santa Fe--------	0-2	8-15	2.0-6.0	0.11-0.13	6.1-7.8	<2	Low-------	0.20	1	4	---
	2-18	15-35	0.6-2.0	0.07-0.09	6.6-7.8	<2	Low-------	0.17			
	18	---	---	---	---	---	----------	----			
Rock outcrop.											
60*:											
Santa Fe--------	0-2	8-15	2.0-6.0	0.11-0.13	6.1-7.8	<2	Low-------	0.20	1	4	---
	2-16	15-35	0.6-2.0	0.07-0.09	6.6-7.8	<2	Low-------	0.17			
	16	---	---	---	---	---	----------	----			
Rock outcrop.											
61*:											
Santa Fe--------	0-4	8-15	2.0-6.0	0.11-0.13	6.1-7.8	<2	Low-------	0.20	1	4	---
	4-14	15-35	0.6-2.0	0.07-0.09	6.6-7.8	<2	Low-------	0.17			
	14	---	---	---	---	---	----------	----			
Rock outcrop.											
62----------	0-6	3-8	2.0-6.0	0.07-0.10	6.1-7.8	<2	Low-------	0.24	1	2	1-2
Santana	6-13	15-30	0.6-2.0	0.12-0.15	6.1-7.8	<2	Low-------	0.32			
	13	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 11.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
63*:											
Santana	0-8	10-25	0.6-2.0	0.16-0.18	6.1-7.8	<2	Low	0.37	1	5	1-2
	8-12	15-30	0.6-2.0	0.12-0.15	6.1-7.8	<2	Low	0.32			
	12	---	---	---	---	---	---	---			
Rock outcrop.											
64*:											
Santana	0-4	8-18	2.0-6.0	0.12-0.15	6.1-7.8	<2	Low	0.32	1	3	1-2
	4-14	15-30	0.6-2.0	0.12-0.15	6.1-7.8	<2	Low	0.32			
	14	---	---	---	---	---	---	---			
Rock outcrop.											
65*:											
Stellar	0-8	20-27	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.28	5	5	1-2
	8-35	35-50	0.06-0.2	0.14-0.16	7.4-8.4	2-4	High	0.28			
	35-60	28-40	0.2-0.6	0.15-0.19	7.4-8.4	2-4	Moderate	0.28			
Mohave	0-3	25-35	0.6-2.0	0.14-0.16	6.6-7.3	<2	Moderate	0.32	5	5	---
	3-39	17-30	0.2-0.6	0.19-0.21	7.4-9.0	<2	Moderate	0.43			
	39-60	18-25	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low	0.32			
66*:											
Stellar	0-6	28-40	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.28	5	6	1-2
	6-26	35-50	0.06-0.2	0.14-0.16	7.4-8.4	2-4	High	0.28			
	26-60	28-40	0.2-0.6	0.15-0.19	7.4-8.4	2-4	Moderate	0.28			
Verhalen	0-10	40-60	<0.06	0.12-0.17	7.4-8.4	0-4	High	0.32	5	4	1-2
	10-60	35-60	<0.06	0.12-0.17	7.4-8.4	0-16	High	0.32			
Mimbres	0-6	28-35	0.2-0.6	0.10-0.16	7.4-8.4	>4	Moderate	0.43	5	6	.5-.7
	6-60	25-35	0.2-0.6	0.10-0.16	7.4-8.4	>4	Moderate	0.43			
67	0-2	35-40	0.06-0.2	0.15-0.20	7.4-9.0	<2	High	0.28	5	4	.5-1
Stirk Variant	2-60	60-70	<0.06	0.08-0.12	7.4-9.0	2-4	High	0.28			
68	0-3	10-22	6.0-20	0.05-0.07	6.6-8.4	<2	Low	0.28	5	8	1-2
Tesajo	3-60	10-22	6.0-20	0.05-0.07	6.6-8.4	<2	Low	0.28			
69*:											
Tesajo	0-9	10-20	6.0-20	0.07-0.09	6.6-8.4	<2	Low	0.32	5	4L	1-2
	9-60	20-30	2.0-6.0	0.05-0.07	6.6-8.4	<2	Low	0.24			
Manzano	0-11	25-35	0.6-2.0	0.09-0.11	6.6-8.4	<2	Moderate	0.28	5	6	2-3
	11-60	18-34	0.6-2.0	0.16-0.21	7.4-8.4	<2	Moderate	0.32			
70	0-4	20-30	0.6-2.0	0.11-0.13	7.4-9.0	<2	Moderate	0.32	5	5	.5-1
Tres Hermanos	4-14	25-35	0.6-2.0	0.12-0.14	7.4-9.0	2-4	Moderate	0.32			
	14-60	18-25	0.6-2.0	0.09-0.11	7.4-9.0	2-4	Low	0.32			
71*:											
Tres Hermanos	0-3	20-30	0.6-2.0	0.11-0.13	7.4-9.0	<2	Moderate	0.32	5	5	.5-1
	3-13	25-35	0.6-2.0	0.12-0.14	7.4-9.0	2-4	Moderate	0.32			
	13-60	18-25	0.6-2.0	0.09-0.11	7.4-9.0	2-4	Low	0.32			
Lehmans	0-3	20-35	0.6-2.0	0.10-0.12	6.6-8.4	<2	Moderate	0.15	1	8	.5-1
	3-17	35-55	0.06-0.2	0.10-0.15	6.6-8.4	<2	High	0.10			
	17	---	---	---	---	---	---	---			
72*:											
Tres Hermanos	0-2	10-18	2.0-6.0	0.12-0.14	7.4-9.0	<2	Low	0.28	5	3	.5-1
	2-18	25-35	0.6-2.0	0.12-0.14	7.4-9.0	2-4	Moderate	0.32			
	18-60	18-25	0.6-2.0	0.09-0.11	7.4-9.0	2-4	Low	0.32			
Upton	0-3	15-27	0.6-2.0	0.08-0.14	7.9-8.4	<2	Low	0.28	2	5	<1
	3-14	30-35	0.6-2.0	0.05-0.08	7.9-8.4	<2	Low	0.32			
	14-25	---	---	---	7.9-8.4	<2	Very low	---			
	25-60	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 11.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
73*:											
White House-----	0-3	23-30	0.2-2.0	0.12-0.19	6.6-8.4	<2	Moderate	0.28	5	6	1-2
	3-20	35-60	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.17			
	20-25	20-35	0.6-2.0	0.09-0.11	6.6-8.4	<2	Low-------	0.24			
	25-60	35-50	0.06-0.2	0.10-0.14	6.6-8.4	<2	Moderate	0.32			
Ruidoso---------	0-10	30-40	0.06-0.6	0.15-0.21	6.6-7.8	<2	Moderate	0.28	5	7	---
	10-60	30-45	0.06-0.2	0.14-0.19	6.6-8.4	<2	Moderate	0.28			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SOIL AND WATER FEATURES

[See text for definitions of "flooding" and terms such as "rare," and "brief." The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
1*, 2*:											
Abrazo	D	None	---	---	21-40	Hard	---	---	Moderate	High	Low.
Luzena	D	None	---	---	7-20	Hard	---	---	Low	High	Low.
3--Anthony	B	Rare	---	---	>60	---	---	---	Low	High	Low.
4--Boysag	D	None	---	---	6-20	Hard	---	---	Low	High	Low.
5*:											
Boysag	D	None	---	---	6-20	Hard	---	---	Low	High	Low.
Abrazo	D	None	---	---	21-40	---	---	---	Moderate	High	Low.
Santana	D	None	---	---	4-18	Hard	---	---	Moderate	Moderate	Low.
6*:											
Bucklebar	B	None	---	---	>60	---	---	---	Low	High	Low.
Sonoita	B	None	---	---	>60	---	---	---	Low	High	Low.
Continental	C	None	---	---	>60	---	---	---	Low	High	Low.
7*:											
Carnero	C	None	---	---	25-34	Hard	---	---	Moderate	High	Low.
Santa Fe	D	None	---	---	8-20	Hard	---	---	Moderate	Moderate	Low.
8--Conger	C	None	---	---	>60	---	10-20	Thin	Low	Moderate	Low.
9*:											
Conger	C	None	---	---	>60	---	10-20	Thin	Low	Moderate	Low.
Stellar	C	None	---	---	>60	---	---	---	Low	High	Low.
10*:											
Continental	C	None	---	---	>60	---	---	---	Low	High	Low.
Nickel	B	None	---	---	>60	---	---	---	Low	High	Low.
11*:											
Dagflat	C	None	---	---	21-40	Hard	---	---	Moderate	High	Low.
Santa Fe	D	None	---	---	8-20	Hard	---	---	Moderate	Moderate	Low.
12*, 13*:											
Encierro	D	None	---	---	10-20	Hard	---	---	Moderate	High	Low.
Rock outcrop.											
14*:											
Gaddes	C	None	---	---	20-40	Soft	---	---	Low	High	Low.
Ruidoso	C	None	---	---	>60	---	---	---	Low	High	Low.
15*:											
Gaddes	C	None	---	---	20-40	Soft	---	---	Low	High	Low.
Santa Fe	D	None	---	---	8-20	Hard	---	---	Moderate	Moderate	Low.
Rock outcrop.											

See footnote at end of table.

TABLE 12.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
16---------- Gila Variant	B	Occasional	Very brief	Apr-Oct	>60	---	---	---	Low------	High-----	Low.
17---------- Guy	B	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
18*:											
Guy----------	B	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
Lonti----------	D	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
19---------- Haverson	B	Rare--------	---	---	>60	---	---	---	Low------	High-----	Low.
20*:											
Hondale----------	D	Rare--------	---	---	>60	---	---	---	Low------	High-----	Moderate.
Verhalen---------	D	Rare--------	---	---	>60	---	---	---	Low------	High-----	Low.
21---------- Jonale	B	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
22*:											
Judd----------	C	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
Manzano----------	C	None--------	---	---	>60	---	---	---	Moderate	High-----	Low.
23*:											
Lehmans----------	D	None--------	---	---	10-20	Hard	---	---	Low------	High-----	Low.
Lithic Haplargids.											
24*:											
Lithic Haplargids.											
Rock outcrop.											
25, 26---------- Lonti	D	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
27*:											
Lonti----------	D	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
Denver Variant---	D	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
28*:											
Lonti----------	D	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
Manzano----------	B	Rare--------	---	---	>60	---	---	---	Moderate	High-----	Low.
29*:											
Lonti----------	D	None--------	---	---	>60	---	---	---	Low------	High-----	Low.
Ustorthents.											
30---------- Luzena	D	None--------	---	---	7-20	Hard	---	---	Low------	High-----	Low.
31*:											
Luzena----------	D	None--------	---	---	7-20	Hard	---	---	Low------	High-----	Low.
Rock outcrop.											

See footnote at end of table.

TABLE 12.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
32, 33---------- Manzano	B	Rare---------	---	---	>60	---	---	---	Moderate	High-----	Low.
34*: Manzano----------	B	None---------	---	---	>60	---	---	---	Moderate	High-----	Low.
Ruidoso----------	C	None---------	---	---	>60	---	---	---	Low------	High-----	Low.
35*: Mimbres----------	C	Frequent----	Very brief	Jul-Sep	>60	---	---	---	Low------	High-----	Low.
Arizo----------	A	Frequent----	Very brief	Mar-Sep	>60	---	---	---	Low------	High-----	Low.
Riverwash.											
36---------- Muzzler	D	None---------	---	---	7-20	Hard	---	---	Low------	Moderate	Low.
37*: Muzzler----------	D	None---------	---	---	7-20	Hard	---	---	Low------	Moderate	Low.
Rock outcrop.											
38*: Nickel----------	B	None---------	---	---	>60	---	---	---	Low------	High-----	Low.
Upton----------	C	None---------	---	---	>60	---	7-20	Thin	Low------	High-----	Low.
39*, 40*: Oro Grande-------	D	None---------	---	---	4-20	Hard	---	---	Moderate	Moderate	Low.
Rock outcrop.											
41*. Orthents											
42---------- Paymaster	B	None---------	---	---	>60	---	---	---	Moderate	High-----	Low.
43*, 44*: Paymaster---------	B	Rare---------	---	---	>60	---	---	---	Moderate	High-----	Low.
Ellicott---------	A	Frequent----	Brief-----	Jul-Sep	>60	---	---	---	Low------	Moderate	Low.
45*: Paymaster---------	B	Rare---------	---	---	>60	---	---	---	Moderate	High-----	Low.
Ellicott---------	A	Frequent----	Brief-----	Jul-Sep	>60	---	---	---	Low------	Moderate	Low.
Manzano----------	B	Rare---------	---	---	>60	---	---	---	Moderate	High-----	Low.
46*: Pits.											
Dumps.											
47---------- Plack	D	None---------	---	---	>60	---	8-20	Thin	Low------	Moderate	Low.
48*, 49*: Plack Variant----	D	None---------	---	---	6-20	Hard	---	---	Low------	High-----	Low.
Guy----------	B	None---------	---	---	>60	---	---	---	Low------	High-----	Low.
50*. Riverwash											

See footnote at end of table.

TABLE 12.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
51*:											
Rock outcrop.											
Graham	D	None	---	---	10-20	Hard	---	---	Low	High	Low.
52*:											
Rock outcrop.											
Lithic Ustorthents.											
53*:											
Rock outcrop.											
Luzena	D	None	---	---	7-20	Hard	---	---	Low	High	Low.
54*:											
Rock outcrop.											
Muzzler	D	None	---	---	7-20	Hard	---	---	Low	Moderate	Low.
55--Ruidoso	C	None	---	---	>60	---	---	---	Low	High	Low.
56*:											
Ruidoso	C	None	---	---	>60	---	---	---	Low	High	Low.
Muzzler	D	None	---	---	7-20	Hard	---	---	Low	Moderate	Low.
57*:											
Sampson	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Dagflat	C	None	---	---	21-40	Hard	---	---	Moderate	High	Low.
58*:											
Sanloren	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Majada Variant	B	None	---	---	>60	---	---	---	Low	Moderate	Low.
59*, 60*, 61*:											
Santa Fe	D	None	---	---	8-20	Hard	---	---	Moderate	Moderate	Low.
Rock outcrop.											
62--Santana	D	None	---	---	4-18	Hard	---	---	Moderate	Moderate	Low.
63*, 64*:											
Santana	D	None	---	---	4-18	Hard	---	---	Moderate	Moderate	Low.
Rock outcrop.											
65*:											
Stellar	C	None	---	---	>60	---	---	---	Low	High	Low.
Mohave	B	None	---	---	>60	---	---	---	Low	High	Low.
66*:											
Stellar	C	None	---	---	>60	---	---	---	Low	High	Low.
Verhalen	D	Rare	---	---	>60	---	---	---	Low	High	Low.
Mimbres	B	Rare	---	---	>60	---	---	---	Low	High	Low.
67--Stirk Variant	D	Rare	---	---	>60	---	---	---	Low	High	Moderate.
68--Tesajo	A	None	---	---	>60	---	---	---	Low	Moderate	Low.

See footnote at end of table.

TABLE 12.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
69*:											
Tesajo	A	Rare	---	---	>60	---	---	---	Low	Moderate	Low.
Manzano	C	Rare	---	---	>60	---	---	---	Moderate	High	Low.
70 Tres Hermanos	B	None	---	---	>60	---	---	---	Low	High	Low.
71*:											
Tres Hermanos	B	None	---	---	>60	---	---	---	Low	High	Low.
Lehmans	D	None	---	---	10-20	Hard	---	---	Low	High	Low.
72*:											
Tres Hermanos	B	None	---	---	>60	---	---	---	Low	High	Low.
Upton	C	None	---	---	>60	---	7-20	Thin	Low	High	Low.
73*:											
White House	C	None	---	---	>60	---	---	---	Low	High	Moderate.
Ruidoso	C	None	---	---	>60	---	---	---	Low	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Abrazo	Fine, mixed, mesic Aridic Argiustolls
Anthony	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Arizo	Sandy-skeletal, mixed, thermic Typic Torriorthents
Boysag	Clayey, mixed, mesic Lithic Ustollic Haplargids
Bucklebar	Fine-loamy, mixed, thermic Typic Haplargids
Carnero	Fine, mixed, mesic Aridic Argiustolls
Conger	Loamy, mixed, thermic, shallow Ustollic Paleorthids
Continental	Fine, mixed, thermic Typic Haplargids
Dagflat	Fine-loamy, mixed, mesic Aridic Argiustolls
Denver Variant	Fine, mixed, mesic Torrertic Argiustolls
Ellicott	Sandy, mixed, mesic Ustic Torrifluvents
Encierro	Clayey, mixed, mesic Lithic Argiustolls
Gaddes	Fine-loamy, mixed, mesic Ustollic Haplargids
Gila Variant	Fine-loamy, mixed (calcareous), thermic Typic Torrifluvents
Graham	Clayey, montmorillonitic, thermic Lithic Argiustolls
Guy	Coarse-loamy, mixed, mesic Aridic Calciustolls
Haverson	Fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents
Hondale	Fine, mixed, thermic Typic Natrargids
Jonale	Fine-loamy, mixed, mesic Aridic Calciustolls
Judd	Fine, mixed, mesic Typic Argiustolls
Lehmans	Clayey, montmorillonitic, thermic Lithic Haplargids
Lonti	Fine, mixed, mesic Ustollic Haplargids
Luzena	Clayey, montmorillonitic, mesic Lithic Argiustolls
Majada Variant	Loamy-skeletal, mixed, mesic Aridic Argiustolls
Manzano	Fine-loamy, mixed, mesic Cumulic Haplustolls
Mimbres	Fine-silty, mixed, thermic Typic Camborthids
Mohave	Fine-loamy, mixed, thermic Typic Haplargids
Muzzler	Clayey-skeletal, mixed, mesic Lithic Argiustolls
Nickel	Loamy-skeletal, mixed, thermic Typic Calciorthids
Oro Grande	Loamy-skeletal, mixed, mesic Lithic Haplustolls
Paymaster	Coarse-loamy, mixed, mesic Cumulic Haplustolls
Plack	Loamy, mixed, mesic, shallow Petrocalcic Calciustolls
Plack Variant	Loamy, mixed, mesic Lithic Calciustolls
*Ruidoso	Fine, mixed, mesic Pachic Argiustolls
Sampson	Fine-loamy, mixed, mesic Pachic Argiustolls
Sanloren	Clayey-skeletal, mixed, mesic Pachic Argiustolls
Santa Fe	Loamy-skeletal, mixed, mesic Lithic Argiustolls
Santana	Loamy, mixed, mesic Lithic Haplustolls
Sonoita	Coarse-loamy, mixed, thermic Typic Haplargids
Stellar	Fine, mixed, thermic Ustollic Haplargids
Stirk Variant	Fine, montmorillonitic (calcareous), mesic Vertic Ustifluvents
Tesajo	Loamy-skeletal, mixed, mesic Cumulic Haplustolls
Tres Hermanos	Fine-loamy, mixed, thermic Typic Haplargids
Upton	Loamy, carbonatic, thermic, shallow Typic Paleorthids
Verhalen	Fine, montmorillonitic, thermic Mollic Torrerts
White House	Fine, mixed, thermic Ustollic Haplargids

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

Part III. Forest Service land

This part discusses the detailed map units on Forest Service land. It discusses the use and management of the soils, gives the classification of the soils, and discusses the taxonomic units and their morphology.

Detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

Three kinds of map units are shown on the soil maps for this part of the survey: consociations, complexes, and associations.

A soil consociation is a map unit in which the areas are dominated by soils that are classified the same. An example is Lithic Haploborolls, warm, 40 to 80 percent slopes.

A soil complex consists of areas of two or more soils so interminged or so small that they cannot be shown separately on the soil maps at a scale of 1:24,000. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils joined by a hyphen. An example is Cumulic Haplustolls-Aridic Haplustalfs complex, 1 to 15 percent slopes.

A soil association is made of up adjacent soils that occur as areas large enough to be shown individually on the soil maps but that are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils can differ greatly one from the other. The name of an association consists of the names of the dominant soils joined by a hyphen. An example is Aridic Haplustalfs-Typic Ustorthents association, 40 to 80 percent slopes.

In this part of the survey area, there were three kinds of soil subgroup modifiers—moist, dry, and warm. The name of a soil subgroup modifier indicates a feature that affects management. Moist means it has more moisture than is typical, and dry means just the opposite.

Table 1 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of 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.

Map unit descriptions

74—Aridic Haplustalfs, fine, mixed, mesic-Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic association, 15 to 40 percent slopes. This map unit is on low hills and in smooth mountainous areas. The soils in the unit formed in residuum and colluvium derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly alligator juniper and gray oak on the north-facing side slopes and grama grasses and sacahuista on the south-facing side slopes. Elevation is 5,000 to 5,800 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 35 percent Aridic Haplustalfs, fine, mixed, mesic, and 35 percent Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic.

Included in this unit are Lithic Argiustolls, Lithic Haplustolls, Aridic Argiustolls, Aridic Ustochrepts, and Lithic Ustochrepts. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Aridic Haplustalfs, fine, mixed, mesic, are moderately deep and deep and are well drained. In a reference profile, the surface layer is dark brown very cobbly clay loam about 3 inches thick. The subsoil is brown gravelly clay and light yellowish brown gravelly sandy clay about 19 inches thick. The substratum is light yellowish brown gravelly sandy clay about 6 inches thick over fractured rhyolite. Depth to rhyolite ranges from 20 to 60 inches.

Permeability of these soils generally is moderately slow. Available water capacity is very low. Effective rooting depth is 20 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, are deep and well drained. In a reference profile, the surface layer is brown gravelly sandy loam about 7 inches thick. The upper 43 inches of the substratum is pale brown and very pale brown very gravelly sandy loam, and the lower part to a depth of 60 inches is light yellowish brown gravelly loamy sand.

Permeability of these soils generally is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat and fuelwood production. It is also used as watershed and for recreation.

The potential plant community on Aridic Haplustalfs, fine, mixed, mesic, is mainly grama grasses and sacahuista. The understory vegetation typically consists of alligator juniper, oneseed juniper, mesquite, sacahuista, acacia, galleta, gray oak, ceanothus, datil yucca, cactus, blue grama, sideoats grama, muhly, and black grama. The potential plant community on Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, is mainly alligator juniper and gray oak. The understory vegetation typically consists of oneseed juniper, pinyon, turbinella oak, sacahuista, wolftail, datil yucca, soaptree yucca, pricklypear, skunkbush sumac, sideoats grama, blue grama, New Mexico muhly, and poverty threeawn.

Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, are poorly suited to fuelwood production. They can produce 2 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. Aridic Haplustalfs, fine, mixed, mesic, are not used for fuelwood production.

75—Aridic Haplustalfs-Typic Ustorthents association, 40 to 80 percent slopes. This map unit is in uneven mountainous areas. The soils in the unit formed in residuum and alluvium derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly blue grama and sacahuista on the south-facing side slopes and alligator juniper and gray oak on the north-facing side slopes. Elevation is 5,000 to 5,800 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 35 percent Aridic Haplustalfs and 35 percent Typic Ustorthents.

Included in this unit are Aridic Argiustolls, Lithic Haplustolls, Aridic Haplustolls, Lithic Ustorthents, and Lithic Argiustolls. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Aridic Haplustalfs are moderately deep and deep and are well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is light brown and yellowish brown very gravelly loamy sand and gravelly sandy loam about 3 inches thick. The subsoil is brown gravelly sandy clay loam about 26 inches thick. The substratum is brown extremely gravelly sandy loam about 28 inches thick. Bedrock is at a depth of 20 to 60 inches or more.

Permeability of these soils generally is moderately slow. Available water capacity is low. Effective rooting depth is 20 to 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Typic Ustorthents are moderately deep and deep and are well drained. Texture is variable. In a reference profile, the surface layer is light yellowish brown very gravelly sandy loam about 4 inches thick. The substratum is very pale brown and light brown very cobbly sandy loam about 28 inches thick. Bedrock is at a depth of 32 inches. Depth to bedrock ranges from 20 to 60 inches or more.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is 20 to 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat. It is also used as watershed and for recreation. A few areas are used for fuelwood production.

The potential plant community on Aridic Haplustalfs is mainly blue grama and sacahuista. The understory vegetation typically consists of blue grama, sacahuista, sideoats grama, black grama, galleta, datil yucca, cactus, muhly, mesquite, acacia, gray oak, turbinella oak, turpentinebush, and sotol. The potential plant community on Typic Ustorthents is mainly gray oak and alligator juniper. The understory vegetation typically consists of gray oak, turbinella oak, sacahuista, wolftail, datil yucca, soaptree yucca, pricklypear, skunkbush sumac, sideoats grama, blue grama, New Mexico muhly, poverty threeawn, pinyon, and oneseed juniper.

Typic Ustorthents are poorly suited to fuelwood production. They can produce 3 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. Aridic Haplustalfs are not used for fuelwood production.

76—Cumulic Haplustolls-Aridic Haplustalfs complex, 1 to 15 percent slopes. This map unit is on alluvial bottoms and mountainsides. The soils in the unit formed in alluvium derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly blue grama and sacahuista. Elevation is 4,400 to 5,600 feet. The average annual precipitation is 10 to 12

inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 45 percent Cumulic Haplustolls and 40 percent Aridic Haplustalfs. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Ustollic Haplargids and Aridic Ustochrepts. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Cumulic Haplustolls are deep and well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is yellowish brown very gravelly sandy loam and dark yellowish brown gravelly sandy loam about 8 inches thick. The substratum is dark yellowish brown gravelly sandy loam and dark yellowish brown extremely cobbly sandy loam about 36 inches thick.

Permeability of these soils generally is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate to high. These soils are subject to very brief periods of flooding in summer. The hazard of soil blowing is slight.

Aridic Haplustalfs are moderately deep and deep and are well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is light brown very gravelly loamy sand and yellowish brown gravelly sandy loam about 3 inches thick. The subsoil is brown and reddish brown gravelly sandy clay loam about 26 inches thick. The substratum is brown extremely gravelly sandy loam about 28 inches thick. Bedrock is at a depth of 20 to 60 inches or more.

Permeability of these soils generally is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly blue grama and sacahuista. The understory vegetation typically consists of blue grama, sacahuista, sideoats grama, black grama, galleta, datil yucca, cactus, acacia, gray oak, soaptree yucca, muhly, mesquite, broom snakeweed, Mormon-tea, turpentinebush, sotol, and sand dropseed.

77—Lithic Haploborolls, loamy, mixed, warm, 1 to 15 percent slopes. This map unit is on low hills and in uneven mountainous areas. The soils in the unit formed in residuum and colluvium derived dominantly from granite. The native vegetation is mainly ponderosa pine and alligator juniper. Elevation is 6,200 to 7,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 140 to 170 days.

Included in this unit are shallow to moderately deep Ustorthents and Argiborolls. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Lithic Haploborolls, loamy, mixed, warm, are shallow and well drained. In a reference profile, the upper 2 inches of the surface layer is grayish brown sandy loam and the lower 5 inches is gravelly sandy loam. The substratum is pale brown gravelly loamy sand about 3 inches thick. Granite is at a depth of 10 inches.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used mainly as rangeland, for wildlife habitat, and for fuelwood and timber production. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly ponderosa pine and alligator juniper. The understory vegetation typically consists of gray oak, Gambel oak, silverleaf oak, blue grama, sideoats grama, bottlebrush squirreltail, pine dropseed, muttongrass, and pinyon.

This unit is poorly suited to timber production. The site index for ponderosa pine ranges from 30 to 50. The main concerns in management are low productivity and low potential for reforestation.

This unit is poorly suited to fuelwood production. It can produce 1 cord of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

78—Lithic Haploborolls, loamy, mixed, warm, 15 to 40 percent slopes. This map unit is on low hills and in uneven mountainous areas. The soils in the unit formed in residuum and colluvium derived dominantly from granite. The native vegetation is mainly ponderosa pine and alligator juniper. Elevation is 6,200 to 7,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 140 to 170 days.

Included in this unit are shallow to moderately deep Ustorthents and Argiborolls. Included areas make up about 40 percent of the total acreage. The percentage varies from one area to another.

Lithic Haploborolls, loamy, mixed, warm, are shallow and well drained. In a reference profile, the upper 2 inches of the surface layer is grayish brown sandy loam and the lower 5 inches is gravelly sandy loam. The substratum is pale brown gravelly loamy sand about 3 inches thick. Granite is at a depth of 10 inches.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland, for wildlife habitat, and for fuelwood and timber production. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly ponderosa pine and alligator juniper. The understory vegetation typically consists of gray oak, Gambel oak, silverleaf oak, blue grama, sideoats grama, bottlebrush squirreltail, pine dropseed, muttongrass, and pinyon.

This unit is poorly suited to timber production. The site index for ponderosa pine ranges from 30 to 50. The main concerns in management are the low productivity and low potential for reforestation.

This unit is poorly suited to fuelwood production. It can produce 1 cord of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

79—Lithic Haploborolls, warm, 40 to 80 percent slopes. This map unit is in uneven mountainous areas. The soils in the unit formed in residuum derived dominantly from granite. The native vegetation is mainly ponderosa pine and alligator juniper. Elevation is 6,200 to 7,600 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 140 to 170 days.

Included in this unit are Typic Eutroboralfs, warm; Lithic Argiborolls, warm; Lithic Ustorthents; and Udic Ustorthents. Included areas make up about 40 percent of the total acreage. The percentage varies from one area to another.

Lithic Haploborolls, warm, are shallow and well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is covered with a layer of forest litter. The surface layer is dark grayish brown stony sandy loam and gravelly sandy loam about 10 inches thick. The subsoil is brown very gravelly sandy clay loam about 5 inches thick. Bedrock is at a depth of 15 inches.

Permeability of these soils generally is moderate. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly ponderosa pine and alligator juniper. The understory vegetation typically consists of gray oak, Gambel oak, silverleaf oak, blue grama, sideoats grama, bottlebrush squirreltail, pine dropseed, muttongrass, and pinyon.

This unit is poorly suited to timber production. The site index for ponderosa pine ranges from 30 to 50. The main concerns in management are the low productivity and low potential for reforestation.

This unit is poorly suited to fuelwood production. It can produce 1 cord of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

80—Lithic Haplustalfs, dry-Aridic Haplustalfs complex, 15 to 40 percent slopes. This map unit is on mountainsides and low hills. The soils in the unit formed in residuum and alluvium derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly blue grama and sacahuista. Elevation is 5,000 to 5,900 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 45 percent Lithic Haplustalfs, dry, and 35 percent Aridic Haplustalfs. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Aridic Argiustolls, Aridic Ustochrepts, Lithic Argiustolls, Lithic Ustochrepts, and Lithic Haplustolls. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Lithic Haplustalfs, dry, are shallow and well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is dark yellowish brown very gravelly sandy loam about 2 inches thick. The upper 7 inches of the subsoil is dark brown very gravelly sandy loam, and the lower 10 inches is dark yellowish brown very gravelly sandy clay loam. Granite is at a depth of 19 inches.

Permeability of these soils generally is moderate. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Aridic Haplustalfs are moderately deep and deep and are well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is light brown very gravelly loamy sand and yellowish brown gravelly sandy loam about 3 inches thick. The subsoil is brown gravelly sandy clay loam about 26 inches thick. The substratum is brown extremely gravelly sandy loam and very gravelly sandy loam about 28 inches thick. Depth to bedrock is 20 to 60 inches or more.

Permeability of these soils generally is moderately slow. Available water capacity is low. Effective rooting depth is 20 to 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly blue grama and sacahuista. The understory vegetation typically consists of blue grama, sacahuista, sideoats grama, black grama, galleta, datil yucca, cactus, muhly, mesquite, acacia, gray oak, oneseed juniper, turbinella oak, turpentinebush, and sotol.

81—Lithic Haplustalfs, dry-Aridic Haplustalfs complex, 40 to 80 percent slopes. This map unit is in uneven mountainous areas and on some low hills. The soils in the unit formed in residuum and alluvium derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly blue grama and sacahuista. Elevation is 4,800 to 6,600 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 35 percent Lithic Haplustalfs, dry, and 30 percent Aridic Haplustalfs. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Aridic Argiustolls, Aridic Ustochrepts, Lithic Argiustolls, Lithic Ustochrepts, and Lithic Haplustolls. Included areas make up about 35 percent of the total acreage. The percentage varies from one area to another.

Lithic Haplustalfs, dry, are shallow and well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is dark yellowish brown very gravelly sandy loam about 2 inches thick. The upper 7 inches of the subsoil is dark brown very gravelly sandy loam, and the lower 10 inches is dark yellowish brown sandy clay loam. Granite is at a depth of 19 inches.

Permeability of these soils generally is moderate. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Aridic Haplustalfs are moderately deep and deep and are well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is light brown to yellowish brown gravelly loamy sand or gravelly sandy loam about 3 inches thick. The subsoil is brown gravelly sandy clay loam about 26 inches thick. The substratum is brown extremely gravelly sandy loam and very gravelly sandy loam about 28 inches thick. Depth to bedrock is 20 to 60 inches or more.

Permeability of these soils generally is moderately slow. Available water capacity is low. Effective rooting depth is 20 to 60 inches or more. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly blue grama and sacahuista. The understory vegetation typically consists of blue grama, sacahuista, sideoats grama, black grama, galleta, datil yucca, cactus, muhly, mesquite, acacia, gray oak, oneseed juniper, turbinella oak, turpentinebush, and sotol.

82—Lithic Haplustalfs, dry-Lithic Ustorthents, moist, association, 40 to 80 percent slopes. This map unit is in uneven mountainous areas and on some low hills. The soils in the unit formed in residuum derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly blue grama and sacahuista on the south-facing side slopes and pinyon and alligator juniper on the north-facing side slopes. Elevation is 4,800 to 5,600 feet. The average annual precipitation is 10 to 18 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 160 to 180 days.

This unit is 30 percent Lithic Haplustalfs, dry, and 30 percent Lithic Ustorthents, moist.

Included in this unit are Lithic Ustorthents; Lithic Argiustolls; Udic Haplustalfs; Lithic Haplustalfs, moist; Typic Ustorthents; and Udic Ustochrepts. Included areas make up about 40 percent of the total acreage. The percentage varies from one area to another.

Lithic Haplustalfs, dry, are shallow and well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is dark yellowish brown very gravelly sandy loam about 2 inches thick. The upper 7 inches of the subsoil is dark brown very gravelly sandy loam, and the lower 10 inches is dark yellowish brown sandy clay loam. Granite is at a depth of 19 inches.

Permeability of these soils generally is moderate. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Lithic Ustorthents, moist, are shallow and well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is pale brown very stony sandy loam and yellowish brown very cobbly sandy loam about 10 inches thick. The substratum is light yellowish brown cobbly sandy loam about 7 inches thick. Bedrock is at a depth of 17 inches.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat. It is also used as watershed and for recreation. A few areas are used for fuelwood production.

The potential plant community on Lithic Haplustalfs, dry, is mainly blue grama and sacahuista. The understory vegetation typically consists of oneseed juniper, mesquite, sacahuista, cactus, turbinella oak, gray oak, datil yucca, turpentinebush, sotol, blue grama, sideoats grama, galleta, muhly, and black grama. The potential plant community on Lithic Ustorthents, moist, is mainly pinyon and alligator juniper. The understory vegetation typically consists of gray oak, turbinella oak, Wright silktassel, sacahuista, datil yucca, hairy

mountainmahogany, blue grama, sideoats grama, little bluestem, longtongue muhly, wolftail, and oneseed juniper.

Lithic Ustorthents, moist, are poorly suited to fuelwood production. They can produce 4 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. Lithic Haplustalfs, dry, are not used for fuelwood production.

83—Lithic Haplustalfs, loamy-skeletal, mixed, mesic-Lithic Haplustolls, loamy-skeletal, mixed, mesic complex, moist, 15 to 40 percent slopes. This map unit is on low hills and in smooth to uneven mountainous areas. The soils in the unit formed in residuum derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly pinyon and alligator juniper. Elevation is 5,700 to 6,600 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 30 percent Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist, and 25 percent Lithic Haplustolls, loamy-skeletal, mixed, mesic, moist. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Lithic Argiustolls, moist; Udic Argiustolls; Udic Haplustolls; and Lithic Ustorthents, moist. Included areas make up about 45 percent of the total acreage. The percentage varies from one area to another.

Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist, are shallow and well drained. In a reference profile, the surface layer is dark yellowish brown very gravelly sandy loam about 2 inches thick. The subsoil is yellowish brown very cobbly sandy loam and very cobbly sandy clay loam about 16 inches thick. Bedrock is at a depth of 18 inches.

Permeability of these soils generally is moderately slow. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Lithic Haplustolls, loamy-skeletal, mixed, mesic, moist, are shallow and well drained. In a reference profile, the surface layer is brown very gravelly sandy loam about 2 inches thick. The subsoil is brown very gravelly sandy loam about 8 inches thick. Bedrock is at a depth of 10 inches.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat and fuelwood production. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly pinyon and alligator juniper. The understory vegetation typically consists of oak, hairy mountainmahogany, datil yucca, cactus, blue grama, sideoats grama, oneseed juniper, Wright silktassel, muhly, wolftail, and sacahuista.

This unit is well suited to fuelwood production. It can produce 12 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

84—Lithic Haplustolls, loamy-skeletal, mixed, mesic-Typic Haplustalfs, fine, mixed, mesic complex, 40 to 80 percent slopes. This map unit is in smooth to uneven mountainous areas. The soils in the unit formed in residuum derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly alligator juniper and gray oak. Elevation is 5,400 to 7,000 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 30 percent Lithic Haplustolls, loamy-skeletal, mixed, mesic, and 30 percent Typic Haplustalfs, fine, mixed, mesic. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Lithic Argiustolls, Typic Argiustolls, Typic Haplustolls, Lithic Haplustalfs, Typic Ustochrepts, and Lithic Ustochrepts. Included areas make up about 40 percent of the total acreage. The percentage varies from one area to another.

Lithic Haplustolls, loamy-skeletal, mixed, mesic, are shallow and well drained. In a reference profile, the soil is brown very gravelly sandy loam about 8 inches thick. Bedrock is at a depth of 8 inches.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Typic Haplustalfs, fine, mixed, mesic, are moderately deep and deep and are well drained. In a reference profile, the surface layer is brown very gravelly clay loam about 3 inches thick. The subsoil is yellowish red gravelly sandy clay about 14 inches thick. The substratum is brown very gravelly sandy loam about 9 inches thick. Bedrock is at a depth of 26 inches. Depth to bedrock is 20 to 60 inches or more.

Permeability of these soils generally is slow. Available water capacity is very low. Effective rooting depth is 20 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly alligator juniper and gray oak. Typical understory vegetation consists of oak, hairy mountainmahogany, cactus, sacahuista, datil yucca, soaptree yucca, blue

grama, sideoats grama, New Mexico muhly, pinyon wolftail, oneseed juniper, and Wright silktassel.

This unit is poorly suited to fuelwood production. It can produce 6 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

85—Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic-Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic complex, moist, 40 to 80 percent slopes. This map unit is in uneven mountainous areas. The soils in the unit formed in residuum and colluvium derived dominantly from granite, rhyolite, and gneiss. The native vegetation is mainly pinyon and alligator juniper. Elevation is 4,600 to 6,900 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 30 percent Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist, and 30 percent Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Lithic Ustochrepts, moist; Lithic Argiustolls, moist; and Udic Haplustalfs. Included areas make up about 40 percent of the total acreage. The percentage varies from one area to another.

Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist, are shallow and well drained. In a reference profile, the soil is yellowish brown very gravelly sandy loam about 10 inches thick. Bedrock is at a depth of 10 inches.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist, are moderately deep and deep and are well drained. In a reference profile, the surface layer is brown very gravelly sandy loam about 7 inches thick. The substratum is very pale brown very stony loamy fine sand about 53 inches thick. Bedrock is at a depth of 20 to 60 inches or more.

Permeability of these soils generally is moderately rapid. Available water capacity is low. Effective rooting depth is 20 inches or more. Runoff is medium, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat and fuelwood production. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly pinyon and alligator juniper. The understory vegetation typically consists of oneseed juniper; gray oak, Wright silktassel, sacahuista, wolftail, hairy mountainmahogany, turbinella oak, sideoats grama, longtongue muhly, mountain muhly, blue grama, little bluestem, and datil yucca.

This unit is well suited to fuelwood production. It can produce 10 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

86—Rock outcrop-Ustorthents-Haplustolls complex, 25 to 100 percent slopes. This map unit is on canyonsides, hillsides, and mountainsides. It formed in residuum and colluvium derived dominantly from granite, rhyolite, and altered andesite. The native vegetation is mainly alligator juniper and gray oak. Elevation is 5,200 to 6,600 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 60 percent Rock outcrop, 20 percent Ustorthents, and 20 percent Haplustolls. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Rock outcrop consists of areas of exposed granite, rhyolite, and andesite that support little if any vegetation.

Ustorthents are shallow to deep and are well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is yellowish brown extremely gravelly sandy loam about 7 inches thick. The substratum is very pale brown extremely gravelly sandy loam about 5 inches thick. Bedrock is at a depth of 5 to 60 inches or more.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is 5 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderately high. The hazard of soil blowing is slight.

Haplustolls are shallow to deep and are well drained. Texture and the content of rock fragments are variable. In a reference profile, the surface layer is yellowish brown and dark yellowish brown gravelly sandy loam about 8 inches thick. The substratum is dark yellowish brown gravelly sandy loam and yellowish brown extremely cobbly sandy loam about 52 inches thick. Bedrock is at a depth of 5 to 60 inches or more.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is 5 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly alligator juniper and gray oak. The understory vegetation typically consists of oak, hairy mountainmahogany, cactus, sacahuista, datil yucca, soaptree yucca, blue grama, sideoats grama, New Mexico muhly, wolftail, oneseed juniper, pinyon, and Wright silktassel. The

production of forage is limited by the areas of Rock outcrop in the unit.

87—Typic Haplustalfs, fine, mixed, mesic-Lithic Haplustolls, loamy-skeletal, mixed, mesic complex, 1 to 15 percent slopes. This map unit is on nearly level alluvial plains and in uneven mountainous areas. The soils in the unit formed in old alluvium and residuum derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly alligator juniper and gray oak. Elevation is 5,400 to 6,500 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 30 percent Typic Haplustalfs, fine, mixed, mesic, and 30 percent Lithic Haplustolls, loamy-skeletal, mixed, mesic. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Lithic Argiustolls, Lithic Haplustalfs, Typic Argiustolls, Lithic Ustorthents, and Typic Ustorthents. Included areas make up about 40 percent of the total acreage. The percentage varies from one area to another.

Typic Haplustalfs, fine, mixed, mesic, are moderately deep and deep and are well drained. In a reference profile, the surface layer is brown very gravelly clay loam about 3 inches thick. The subsoil is reddish brown gravelly clay and yellowish red gravelly sandy clay about 14 inches thick. The substratum is brown very gravelly sandy loam about 9 inches thick. Bedrock is at a depth of 26 inches. Depth to bedrock is 20 to 60 inches or more.

Permeability of these soils generally is slow. Available water capacity is very low. Effective rooting depth is 20 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Lithic Haplustolls, loamy-skeletal, mixed, mesic, are shallow and well drained. In a reference profile, the soil is brown very gravelly sandy loam about 8 inches thick. Bedrock is at a depth of 8 inches. Depth to bedrock is 5 to 19 inches.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat and fuelwood production. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly alligator juniper and gray oak. The understory vegetation typically consists of oak, hairy mountainmahogany, cactus, sacahuista, datil yucca, soaptree yucca, blue grama, sideoats grama, New Mexico muhly, pinyon, wolftail, oneseed juniper, and Wright silktassel.

This unit is poorly suited to fuelwood production. It can produce 8 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

88—Typic Haplustalfs, fine, mixed, mesic-Lithic Haplustolls, loamy-skeletal, mixed, mesic complex, 15 to 40 percent slopes. This map unit is in smooth and uneven mountainous areas. The soils in the unit formed in residuum derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly alligator juniper and gray oak. Elevation is 5,400 to 6,500 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 30 percent Typic Haplustalfs and 30 percent Lithic Haplustolls. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Lithic Argiustolls, Lithic Haplustalfs, Typic Argiustolls, and Ustorthents. Included areas make up about 40 percent of the total acreage. The percentage varies from one area to another.

Typic Haplustalfs, fine, mixed, mesic, are moderately deep and deep and are well drained. In a reference profile, the surface layer is brown very gravelly clay loam about 3 inches thick. The subsoil is reddish brown gravelly clay and yellowish red gravelly sandy clay about 14 inches thick. The substratum is brown very gravelly sandy loam about 9 inches thick. Bedrock is at a depth of 26 inches. Depth to bedrock is 20 to 60 inches or more.

Permeability of these soils generally is slow. Available water capacity is very low. Effective rooting depth is 20 to 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Lithic Haplustolls, loamy-skeletal, mixed, mesic, are shallow and well drained. In a reference profile, the soil is brown very gravelly sandy loam about 8 inches thick. Bedrock is at a depth of 8 inches. Depth to bedrock is 5 to 19 inches.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat and fuelwood production. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly alligator juniper and gray oak. The understory vegetation typically consists of oak, hairy mountainmahogany, cactus, sacahuista, datil yucca, soaptree yucca, blue grama, sideoats grama, New Mexico muhly, pinyon, wolftail, oneseed juniper, and Wright silktassel.

This unit is poorly suited to fuelwood production. It can produce 8 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

89—Typic Ustipsamments, mixed, mesic-Cumulic Haplustolls, coarse-loamy, mixed, mesic complex, 1 to 10 percent slopes. This map unit is on alluvial bottoms and alluvial fans. The soils in this unit formed in alluvium derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly riparian desertwillow, Arizona walnut, and alligator juniper. Elevation is 5,000 to 5,700 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 50 percent Typic Ustipsamments, mixed, mesic, and 30 percent Cumulic Haplustolls, coarse-loamy, mixed, mesic. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Typic Ustifluvents and Aridic Haplustolls. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Typic Ustipsamments, mixed, mesic, are deep and well drained. In a reference profile, the surface layer is brown and yellowish brown gravelly loamy sand about 8 inches thick. The substratum is yellowish brown gravelly loamy sand about 52 inches thick.

Permeability of these soils generally is rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is high. These soils are subject to flooding in summer. Channeling and deposition are common along streambanks. The hazard of soil blowing is slight to moderate.

Cumulic Haplustolls, coarse-loamy, mixed, mesic, are deep and well drained. In a reference profile, the surface layer is brown and dark grayish brown sandy loam about 33 inches thick. The substratum is dark brown gravelly sandy loam about 27 inches thick.

Permeability of these soils generally is rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is high. These soils are subject to flooding in summer. Channeling and deposition are common along streambanks. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat and fuelwood production. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly alligator juniper, Arizona walnut, and desertwillow. The understory vegetation typically consists of gray oak, sacahuista, soaptree yucca, cactus, broom muhly, and sand dropseed.

This unit is poorly suited to fuelwood production. It can produce 6 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot.

90—Udic Ustochrepts, coarse-loamy, mixed, mesic-Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist complex, 1 to 15 percent slopes. This map unit is on mountainsides, low hills, and alluvial plains. The soils in this unit formed in residuum and alluvium derived dominantly from granite, rhyolite, and conglomerate. The native vegetation is mainly pinyon, alligator juniper, and gray oak. Elevation is 5,600 to 6,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 150 to 180 days.

This unit is 35 percent Udic Ustochrepts, coarse-loamy, mixed, mesic, and 35 percent Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are Lithic Haplustolls, moist; Udic Argiustolls; and Lithic Argiustolls, moist. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Udic Ustochrepts, coarse-loamy, mixed, mesic, are moderately deep and deep and are well drained. In a reference profile, the surface layer is brown and pale brown sandy loam about 9 inches thick. The subsoil is light yellowish brown sandy loam about 11 inches thick. The substratum is light yellowish brown sandy loam about 40 inches thick. Bedrock is at a depth of 20 to 60 inches or more.

Permeability of these soils generally is moderately rapid. Available water capacity is high. Effective rooting depth is 20 to 60 inches or more. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is slight.

Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist, are shallow and well drained. In a reference profile, the surface layer is dark yellowish brown very gravelly sandy loam about 2 inches thick. The upper 8 inches of the subsoil is dark brown and yellowish brown very cobbly sandy loam, and the lower 8 inches is yellowish brown very cobbly sandy clay loam. Bedrock is at a depth of 18 inches. Depth to bedrock is 8 to 20 inches.

Permeability of these soils generally is moderately rapid. Available water capacity is very low. Effective rooting depth is less than 20 inches. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is slight.

This unit is used mainly as rangeland and for wildlife habitat and fuelwood production. It is also used as watershed and for recreation.

The potential plant community on this unit is mainly pinyon and alligator juniper. The understory vegetation typically consists of oneseed juniper, gray oak, turbinella

oak, sacahuista, datil yucca, blue grama, sideoats grama, Wright silktassel, mountain muhly, longtongue muhly, wolftail, hairy mountainmahogany, and cactus.

This unit is well suited to fuelwood production. It can produce 12 cords of wood per acre in a stand of trees that averages 5 inches in diameter at a height of 1 foot.

Use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment.

In preparing a soil survey, soil scientists collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, vegetation, climate, lithology, landforms, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils as woodland and rangeland.

Rangeland

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and climate.

Table 2 shows, for those soils that are used as or are suited to use as rangeland, the average annual production of vegetation; the potential natural vegetation; and the average percentage of each species. Explanation of the column headings in table 2 follows.

Average production is the amount of vegetation that can be expected to grow annually on rangeland that is supporting the potential natural plant community. It is expressed as the average annual production in pounds per acre of forage and herbage. Forage is the vegetation that is available and palatable to livestock or wildlife. Herbage includes all vegetation, whether or not it is palatable to grazing animals. Average production includes the current year's growth of leaves, twigs, and fruits of woody plants that are 4.5 feet in height or less. It does not include the increase in stem diameter of trees and shrubs.

Potential natural vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total population is given for each species making up the potential natural vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires an evaluation of the condition and trend of the range in order to establish a balance between plant needs and allowable use. While trend is an expression of change in response to past and existing livestock management practices combined with other environmental factors, condition is a subjective expression of the status or health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community. The relationship among condition, trend, and use patterns allows development of managment systems pertinent to the needs of both livestock and other users of our natural resources.

Woodland productivity

Table 3 can be used by forest managers in planning the use of soils for wood production. Only those soils suitable for wood production are listed.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. The potential productivity of pinyon and juniper is expressed as a *site index* and in *cords per acre* in a stand of trees that average 5 inches in diameter at a height of 1 foot.

Woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and trees. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Table 4 shows, for each soil suitable for woodland use, the potential for producing understory vegetation. The total production of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4 1/2 feet. It is expressed in pounds per acre of air-dry forage and herbage in a normal year, when soil moisture is average.

Table 4 also lists the common names of the potential natural vegetation for each soil and the percentage composition for each species.

Soil and water features

Table 5 gives estimates of selected soil and water features. The estimates are used in land use planning.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 5 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; July-September, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 5 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 5.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*7*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 1, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation.

Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustalfs (*Ust*, meaning burnt, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplustalfs (*Hapl*, meaning minimal horizonation, plus *ustalf*, the suborder of the Alfisols).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplustalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, mixed, mesic Typic Haplustalfs.

The soils in this part of the survey have been named at the family, subgroup, or great group level because of their variability and the degree of documentation needed for classification. Classification at this level will meet the needs of the users for forest planning.

Taxonomic units and their morphology

In this section, each taxonomic unit recognized in the National Forest part of the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each taxonomic unit. A reference pedon, a small three-dimensional area of soil, for the taxonomic unit in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*6*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*7*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils.

The map units of each taxonomic unit are described in the section "Detailed soil map units."

Aridic Haplustalfs

Aridic Haplustalfs are moderately deep and deep, well drained soils that formed in residuum and alluvium derived from granite. These soils are on mountainsides. Slope is 1 to 80 percent. Elevation is about 5,320 feet. The mean annual precipitation is 10 to 14 inches, and the mean annual air temperature is 52 to 57 degrees F.

Reference pedon of Aridic Haplustalfs in the NE1/4SW1/4 of sec. 12, T. 22 S., R. 17 W.

A1—0 to 1 inch; light brown (7.5YR 6/4) very gravelly loamy sand, brown (7.5YR 4/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; few very fine pores; 44 percent gravel; medium acid (pH 5.6); abrupt smooth boundary.

A3—1 inch to 3 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; few very fine and fine pores; 15 percent gravel; slightly acid (pH 6.5); abrupt smooth boundary.

B1—3 to 9 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; weak very fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and common fine interstitial pores; few thin clay films lining pores; 25 percent gravel; neutral (pH 6.9); clear smooth boundary.

B2t—9 to 26 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine pores; common thin clay films on peds; 30 percent gravel; mildly alkaline (pH 7.6); clear smooth boundary.

B3—26 to 29 inches; yellowish red (5YR 5/6) very gravelly sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine interstitial pores; few thin clay films lining pores; 40 percent gravel; mildly alkaline (pH 7.8); clear wavy boundary.

C1—29 to 52 inches; brown (7.5YR 5/4) extremely gravelly sandy loam, dark brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial pores; 70 percent gravel; mildly alkaline (pH 7.7); clear wavy boundary.

C2—52 to 60 inches; brown (7.5YR 5/4) very gravelly sandy loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine interstitial pores; 40 percent gravel and 5 percent cobbles; mildly alkaline (pH 7.8).

The mean annual soil temperature is 54 to 59 degrees F. The solum is 37 to 65 inches thick and is medium acid to mildly alkaline. Depth to bedrock is more than 20 inches.

The A1 horizon has hue of 7.5YR or 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 3 to 6. It is 30 to 55 percent gravel and 0 to 10 percent cobbles and stones. The A3 horizon has chroma of 3 or 4. It is 0 to 15 percent gravel.

The B1 horizon has chroma of 3 or 4. It is 15 to 25 percent gravel. The Bt horizon has hue of 5YR to 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 6. It is 0 to 30 percent gravel and 0 to 10 percent cobbles. The B3 horizon is 35 to 60 percent gravel.

The C1 horizon has hue of 7.5YR or 10YR, and it has value of 5 or 6 when dry and 4 or 5 when moist. It is sandy loam or clay loam and is 30 to 90 percent gravel and 0 to 5 percent cobbles. The C2 horizon has hue of 7.5YR or 10YR, and it has value of 5 to 7 when dry and 4 or 5 when moist. It is sandy loam or sandy clay loam and is 35 to 60 percent gravel and 0 to 10 percent cobbles.

Aridic Haplustalfs, fine, mixed, mesic

Aridic Haplustalfs, fine, mixed, mesic, are moderately deep and deep, well drained soils that formed in residuum derived from granite, rhyolite, and conglomerate. These soils are on low hills. Slope is 15 to 40 percent. Elevation is about 5,500 feet. The mean annual precipitation is 10 to 14 inches, and the mean annual air temperature is 52 to 57 degrees F.

Reference pedon of Aridic Haplustalfs, fine, mixed, mesic, in the NE1/4SE1/4 of sec. 9, T. 18 S., R. 16 W.

A1—0 to 3 inches; dark brown (10YR 3/3) very cobbly clay loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine interstitial pores; about 30 percent gravel, 20 percent cobbles, and a few stones; slightly acid (pH 6.4); clear smooth boundary.

B21t—3 to 15 inches; brown (10YR 5/3) gravelly clay, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine, fine, and coarse roots; many very fine interstitial and tubular pores; common moderately thick clay films in pores; 20 percent gravel; neutral (pH 6.8); gradual smooth boundary.

B22t—15 to 22 inches; light yellowish brown (10YR 6/4) gravelly sandy clay, yellowish brown (10YR 5/4) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few fine, medium, and coarse roots; common very fine and fine interstitial and tubular pores; many thick clay films on peds; 20 percent gravel; violently effervescent; mildly alkaline (pH 7.6); gradual wavy boundary.

C—22 to 28 inches; light yellowish brown (10YR 6/4) gravelly sandy clay, yellowish brown (10YR 5/4) moist; massive; hard, firm, sticky and plastic; few fine and coarse roots; common very fine and fine interstitial pores; 20 percent gravel; violently effervescent; mildly alkaline (pH 7.7); gradual wavy boundary.

R—28 inches; rhyolite.

The mean annual soil temperature is 54 to 59 degrees F. The solum is 22 to 41 inches thick and is medium acid to mildly alkaline. Depth to bedrock is 20 to 60 inches or more.

The A1 horizon has hue of 7.5YR to 10YR, value of 3 to 5 when dry and 2 to 4 when moist, and chroma of 2 to 6. It ranges from loam to clay loam. The horizon is 30 to 40 percent gravel and 15 to 20 percent cobbles, and it has a few stones.

The B2t horizon has hue of 5YR to 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 to 8. It ranges from sandy clay to clay and is 5 to 25 percent gravel and 0 to 10 percent cobbles.

The C horizon has hue of 5YR to 10YR, value of 5 or 6 when dry, and chroma of 4 to 8. It ranges from sandy clay to clay and is 5 to 20 percent gravel.

Cumulic Haplustolls

Cumulic Haplustolls are deep, well drained soils that formed in alluvium derived from granite, rhyolite, and conglomerate. These soils are on alluvial bottoms. Slope is 1 to 15 percent. Elevation is about 5,500 feet. The

mean annual precipitation is 10 to 12 inches, and the mean annual air temperature is 52 to 57 degrees F.

Reference pedon of Cumulic Haplustolls in the SW1/4SW1/4 of sec. 1, T. 22 S., R. 17 W.

A11—0 to 2 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine platy structure; soft, loose, nonsticky and nonplastic; few very fine roots; few very fine and fine interstitial pores; 30 percent gravel and 5 percent cobbles; medium acid (pH 6.0); abrupt smooth boundary.

A12—2 to 8 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial pores; 20 percent gravel; neutral (pH 6.8); clear smooth boundary.

C1—8 to 24 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, nonsticky and nonplastic; few very fine, fine, and medium roots; few very fine and fine interstitial pores; 25 percent gravel; neutral (pH 7.0); clear smooth boundary.

C2—24 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial pores; 30 percent gravel and 30 percent cobbles; neutral (pH 7.3).

The mean annual soil temperature is 54 to 59 degrees F. The solum is 8 to 33 inches thick and is medium acid to moderately alkaline. Depth to bedrock is more than 60 inches.

The A horizon has value of 4 or 5 when dry, and it has chroma of 2 to 4. It ranges from sandy loam to sandy clay loam and is 5 to 30 percent gravel and 0 to 5 percent cobbles.

The C1 horizon has value of 4 or 5 when dry and 3 or 4 when moist, and it has chroma of 2 to 4. It is loamy sand or sandy loam and is 20 to 30 percent gravel. The C2 horizon has chroma of 3 or 4. It ranges from sandy loam to sandy clay loam and is 20 to 30 percent gravel and 0 to 30 percent cobbles.

Cumulic Haplustolls, coarse-loamy, mixed, mesic

Cumulic Haplustolls, coarse-loamy, mixed, mesic, are deep, well drained soils that formed in alluvium derived from granite, rhyolite, and conglomerate. These soils are on alluvial bottoms. Slope is 1 to 10 percent. Elevation is about 5,400 feet. The mean annual precipitation is 10 to 14 inches, and the mean annual air temperature is 52 to 57 degrees F.

Reference pedon of Cumulic Haplustolls, coarse-loamy, mixed, mesic, in the NE1/4SW1/4 of sec. 12, T. 21 S., R. 15 W.

A11—0 to 3 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine and fine interstitial pores; neutral (pH 7.0); abrupt smooth boundary.

A12—3 to 20 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common very fine and fine interstitial pores; about 5 percent gravel; neutral (pH 7.0); clear wavy boundary.

A13—20 to 33 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine interstitial pores; about 10 percent gravel; mildly alkaline (pH 7.4); gradual smooth boundary.

C1—33 to 60 inches; dark brown (10YR 4/3) gravelly sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine and fine interstitial pores; about 10 percent gravel and 5 percent cobbles; mildly alkaline (pH 7.5).

The mean annual soil temperature is 54 to 59 degrees F. The solum is 10 to 33 inches thick and is slightly acid to mildly alkaline. Depth to bedrock is more than 60 inches. The 10- to 40-inch control section is less than 18 percent clay.

The A1 horizon has value of 4 or 5 when dry, and it has chroma of 2 to 4. It is 5 to 30 percent gravel in the upper part and 5 to 15 percent in the lower part.

The B2 horizon, where present, has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 3 to 6. It ranges from sand to sandy loam and is 5 to 30 percent gravel and 0 to 5 percent cobbles.

The C1 horizon has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 3 to 6. It ranges from sand to sandy loam and is 5 to 30 percent gravel and 0 to 5 percent cobbles. The C2 horizon, where present, has value of 4 or 5 when dry and 3 or 4 when moist, and it has chroma of 3 or 4. It is sand or loamy sand and is 15 to 30 percent gravel. The C3 and C4 horizons, where present, have value of 3 or 4 when moist and chroma of 2 to 4. They are sand or silty clay loam and are 5 to 40 percent gravel.

Haplustolls

Haplustolls are shallow to deep soils that formed in mixed parent material. These soils are on hillsides. Slope is 25 to 100 percent. Elevation ranges from 4,900 to 6,700 feet. The mean annual precipitation is 12 to 14 inches, and the mean annual air temperature is 52 to 57 degrees F.

Reference pedon of Haplustolls in the NE1/4SW1/4 of sec. 1, T. 22 S., R. 17 W.

A11—0 to 2 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine platy structure; soft, loose, nonsticky and nonplastic; few very fine roots; few very fine and fine interstitial pores; 30 percent gravel and 5 percent cobbles; medium acid (pH 6.0); abrupt smooth boundary.

A12—2 to 8 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial pores; 20 percent gravel; neutral (pH 6.8); clear smooth boundary.

C1—8 to 24 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial pores; 25 percent gravel; neutral (pH 7.0); clear smooth boundary.

C2—24 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial pores; 30 percent gravel and 30 percent cobbles; neutral (pH 7.3).

The mean annual soil temperature is 52 to 57 degrees F. Depth to bedrock is 5 to 60 inches or more. The solum is medium acid to moderately alkaline.

The A11 horizon has value of 4 or 5 when dry, and it has chroma of 1 to 4. It is sandy loam, clay loam, or sandy clay loam and is 0 to 60 percent rock fragments. The A12 horizon has value of 4 or 5 when dry and 2 or 3 when moist, and it has chroma of 2 to 4. It is sandy loam or sandy clay loam and is 0 to 70 percent rock fragments.

The C1 horizon has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 2 to 4. It is sand, sandy loam, or loamy sand and is 10 to 40 percent rock fragments. The C2 horizon has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 3 to 6. It is sandy clay loam, sandy loam, or loamy sand and is 5 to 60 percent rock fragments.

Lithic Haploborolls, loamy, mixed, warm

Lithic Haploborolls, loamy, mixed, warm, are shallow, well drained soils that formed in residuum and colluvium derived from granite. These soils are on low hills and in uneven mountainous areas. Slope is 1 to 40 percent. Elevation is about 6,800 feet. The mean annual precipitation is 16 to 20 inches, and the mean annual air temperature is 42 to 45 degrees F.

Reference pedon of Lithic Haploborolls, loamy, mixed, warm, in the NE1/4NW1/4 of sec. 20, T. 19 S., R. 15 W.

O1—2 inches to 0; layer of litter that includes needles.

A11—0 to 2 inches; grayish brown (10YR 5/2) sandy loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial pores; slightly acid (pH 6.4); clear smooth boundary.

A12—2 to 7 inches; grayish brown (10YR 5/2) gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots and common medium and coarse roots; few very fine and fine interstitial pores; 15 percent gravel; neutral (pH 6.7); clear smooth boundary.

C—7 to 10 inches; pale brown (10YR 6/3) gravelly loamy sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; 30 percent gravel; few fine medium and coarse roots; few very fine and fine interstitial pores; neutral (pH 6.8); clear wavy boundary.

R—10 inches; weathered granite.

The mean annual soil temperature is 44 to 47 degrees F. The solum is 2 to 9 inches thick and is medium acid to neutral. Some pedons have a B2 horizon.

The A11 horizon has value of 3 to 7 when dry and 2 to 3 when moist, and it has chroma of 1 to 3. It is 0 to 18 percent gravel and 0 to 8 percent cobbles and stones. The A12 horizon has value of 2 or 3 when moist, and it has chroma of 2 or 3. It is 0 to 15 percent gravel.

The C horizon has value of 5 to 7 when dry and 3 to 6 when moist, and it has chroma of 2 to 4. It is sandy loam or loamy sand and is 20 to 30 percent gravel.

Lithic Haploborolls, warm

Lithic Haploborolls, warm, are shallow, well drained soils that formed in residuum derived from granite. These soils are in uneven mountainous areas. Slope is 40 to 80 percent. Elevation is about 6,900 feet. The mean annual precipitation is about 16 to 20 inches, and the mean annual air temperature is about 44 degrees F.

Reference pedon of Lithic Haploborolls, warm, in the NW1/4SW1/4 of sec. 5, T. 20 S., R. 15 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) stony sandy loam, very dark brown (10YR 2/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine interstitial pores; about 15 percent stones and 10 percent cobbles; slightly acid (pH 6.2); clear smooth boundary.

A3—3 to 10 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots and common medium roots; common very fine and fine interstitial pores; about 20 percent gravel; slightly acid (pH 6.5); clear smooth boundary.

B2—10 to 15 inches; brown (10YR 5/3) very gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots and common medium roots; few very fine and fine interstitial and tubular pores; about 40 percent gravel; slightly acid (pH 6.3); gradual wavy boundary.

R—15 inches; weathered granite.

The mean annual soil temperature is 44 to 47 degrees F. The solum is 10 to 18 inches thick and is medium acid to neutral. Depth to bedrock is 10 to 18 inches.

The A1 horizon has value of 3 or 4 when dry and 2 or 3 when moist. It is sandy loam or loam and is 5 to 15 percent stones, 0 to 10 percent gravel, and 0 to 10 percent cobbles.

The B1 horizon, where present, has value of 3 or 4 when dry and 2 or 3 when moist, and it has chroma of 2 or 3. It is sandy loam or loam. The horizon is 10 to 25 percent gravel and has few cobbles and stones. The B2 horizon has value of 3 to 5 when dry and 3 or 4 when moist, and it has chroma of 3 or 4. It ranges from sandy loam to sandy clay loam and is 25 to 45 percent gravel.

Lithic Haplustalfs, dry

Lithic Haplustalfs, dry, are shallow, well drained soils that formed in material weathered from granite, rhyolite, and conglomerate. These soils are on mountainsides and low hills. Slope is 15 to 80 percent. Elevation is about 5,500 feet. The mean annual precipitation is about 10 to 18 inches, and the mean annual air temperature is about 52 to 57 degrees F.

Reference pedon of Lithic Haplustalfs, dry, in the SE1/4NW1/4 of sec. 10, T. 18 S., R. 16 W.

A1—0 to 2 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine interstitial pores; about 30 percent gravel, 5 percent stones, and a few cobbles; strongly acid (pH 5.5); abrupt smooth boundary.

B1—2 to 9 inches; dark brown (7.5YR 4/4) very gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; few very fine and fine tubular and interstitial pores; about 40 percent gravel and 5 percent cobbles; slightly acid (pH 6.1); clear smooth boundary.

B2t—9 to 19 inches; dark yellowish brown (10YR 4/6) very gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; few very fine tubular and interstitial pores; few thin clay films on peds; about 40 percent gravel and 5 percent cobbles; neutral (pH 6.8); gradual wavy boundary.

R—19 inches; weathered granite.

The mean annual soil temperature is 54 to 59 degrees F. The solum is 9 to 20 inches thick and is strongly acid to neutral. Depth to bedrock is 9 to 20 inches.

The A1 horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 6. It is sandy loam or sandy clay loam and is 15 to 60 percent gravel, few to 25 percent cobbles, and 0 to 10 percent stones.

The B1 horizon has value of 4 or 5 when dry, and it has chroma of 2 to 6. It ranges from sandy loam to clay loam and is 15 to 40 percent gravel, 5 to 20 percent cobbles, and 0 to 10 percent stones. The B2t horizon has hue of 5YR to 10YR, value of 4 or 5 when dry and 3 to 4 when moist, and chroma of 3 to 6. It ranges from sandy clay loam to clay. The horizon is as much as 90 percent rock fragments, including 10 to 60 percent gravel, 0 to 60 percent cobbles, and 0 to 20 percent stones.

The thin C horizon, where present, is as much as 60 percent gravel.

Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist

Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist, are shallow, well drained soils that formed in residuum derived from granite, rhyolite, and conglomerate. These soils are in smooth to uneven mountainous areas. Slope is 1 to 40 percent. Elevation is about 6,000 feet. The mean annual precipitation is about 14 to 18 inches, and

the mean annual air temperature is about 48 to 54 degrees F.

Reference pedon of Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist, in the SE1/4NW1/4 of sec. 33, T. 18 S., R. 16 W.

A1—0 to 2 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine interstitial pores; 25 percent gravel and 10 percent stones; mildly alkaline (pH 7.8); abrupt smooth boundary.

B1—2 to 5 inches; dark brown (10YR 4/3) very cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; few very fine and fine interstitial and tubular pores; 20 percent gravel and 15 percent cobbles; moderately alkaline (pH 7.9); clear smooth boundary.

B21t—5 to 10 inches; yellowish brown (10YR 5/6) very cobbly sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; hard, friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; few very fine and fine interstitial and tubular pores; few thin clay films in pores; 25 percent gravel and 15 percent cobbles; mildly alkaline (pH 7.6); gradual wavy boundary.

B22t—10 to 18 inches; yellowish brown (10YR 5/4) very cobbly sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; few very fine and fine tubular pores; common thin clay films on peds; 20 percent gravel and 15 percent cobbles; mildly alkaline (pH 7.5); gradual irregular boundary.

R—18 inches; weathered granite.

The mean annual soil temperature is 50 to 56 degrees F. The solum is 5 to 20 inches thick and is strongly acid to mildly alkaline. Depth to bedrock is 8 to 20 inches. The control section is more than 35 percent rock fragments. Some pedons have an A2, B3, or C horizon.

The A1 horizon has value of 3 to 5 when dry and 2 to 4 when moist, and it has chroma of 2 to 6. It ranges from loamy sand to sandy clay loam and is 5 to 40 percent gravel, 0 to 40 percent cobbles, and 0 to 10 percent stones. The A2 horizon, where present, has chroma of 4 to 6.

The B1 horizon has chroma of 2 or 3. It is more than 35 percent gravel and cobbles. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 3 to 5 when moist, and chroma of 2 to 8. It ranges from sandy clay loam to clay loam and is 5 to 45 percent gravel, 0 to 30 percent cobbles, and 0 to 5 percent stones.

The C horizon, where present, has chroma of 4 to 6. It is 30 to 35 percent gravel, 10 to 20 percent cobbles, and 0 to 5 percent stones.

Lithic Haplustolls, loamy-skeletal, mixed, mesic

Lithic Haplustolls, loamy-skeletal, mixed, mesic, are shallow, well drained soils that formed in old alluvium and residuum derived from granite, rhyolite, and conglomerate. These soils are on alluvial plains and in uneven and smooth mountainous areas. Slope is 1 to 80 percent. Elevation is about 5,900 feet. The mean annual precipitation is about 12 to 14 inches, and the mean annual air temperature is about 52 to 57 degrees F.

Reference pedon of Lithic Haplustolls, loamy-skeletal, mixed, mesic, in the NE1/4SW1/4 of sec. 7, T. 21 S., R. 16 W.

A1—0 to 2 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine interstitial pores; about 40 percent gravel and few cobbles; slightly acid (pH 6.2); abrupt smooth boundary.

A3—2 to 8 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine interstitial pores; about 40 percent very fine gravel; slightly acid (pH 6.3); clear smooth boundary.

R—8 inches; highly weathered granite.

The mean annual soil temperature is 54 to 59 degrees F. The solum is 5 to 19 inches thick and is strongly acid to neutral. Depth to bedrock is 5 to 19 inches.

The A1 horizon has value of 4 or 5 when dry, and it has chroma of 2 to 4. It ranges from loamy sand to clay loam and is 5 to 40 percent gravel, 0 to 20 percent cobbles, and 0 to 25 percent stones. The A3 horizon, where present, has chroma of 2 or 3. It is 25 to 40 percent gravel, 0 to 10 percent cobbles, and 0 to 10 percent stones.

The B2 and B3 horizons, where present, have hue of 7.5YR or 10YR, value of 3 to 5 when dry and 2 to 4 when moist, and chroma of 2 to 6. They range from sandy loam to clay loam and are 15 to 60 percent gravel, 0 to 20 percent cobbles, and 0 to 30 percent stones.

The C horizon, where present, has chroma of 4 to 6. It is loamy sand or sandy loam and is 20 to 35 percent gravel, 0 to 30 percent cobbles, and 0 to 5 percent stones.

Lithic Haplustolls, loamy-skeletal, mixed, mesic, moist

Lithic Haplustolls, loamy-skeletal, mixed, mesic, moist, are shallow, well drained soils that formed in residuum derived from granite, rhyolite, and conglomerate. These soils are in smooth to uneven mountainous areas. Slope is 15 to 40 percent. Elevation is about 6,200 feet. The mean annual precipitation is about 14 to 16 inches, and the mean annual air temperature is about 48 to 54 degrees F.

Reference pedon of Lithic Haplustolls, loamy-skeletal, mixed, mesic, moist, in the SE1/4NE1/4 of sec. 20, T. 19 S., R. 15 W.

A1—0 to 2 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine interstitial pores; about 55 percent gravel; medium acid (pH 6.0); abrupt smooth boundary.

B2—2 to 10 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure and weak medium granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; few very fine and fine interstitial pores; about 40 percent gravel; neutral (pH 6.6); abrupt wavy boundary.

R—10 inches; granite.

The mean annual soil temperature is 50 to 56 degrees F. Depth to bedrock is less than 20 inches. The solum is medium acid to neutral. The profile averages more than 35 percent coarse fragments.

The A horizon has value of 4 or 5 when dry. It is 25 to 60 percent gravel and 0 to 50 percent cobbles and stones.

The B2 horizon is 20 to 40 percent gravel.

Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist

Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist, are shallow, well drained soils that formed in residuum and colluvium derived from granite, gneiss, and rhyolite. These soils are in uneven mountainous areas. Slope is 40 to 80 percent. Elevation is about 5,300 feet. The mean annual precipitation is about 14 to 18 inches, and the mean annual air temperature is about 48 to 54 degrees F.

Reference pedon of Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist, in the NE1/4SW1/4 of sec. 9, T. 20 S., R. 15 W.

A1—0 to 2 inches; yellowish brown (10YR 5/4) very stony sandy loam, dark brown (10YR 3/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine interstitial pores; about 20 percent gravel, 20 percent cobbles, and 15 percent stones; medium acid (pH 6.0); abrupt smooth boundary.

A3—2 to 10 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark brown (10YR 4/3) moist; moderate fine granular structure; slightly hard, friable, nonsticky and nonplastic; few very fine, fine, and medium roots; few very fine and fine interstitial pores; about 40 percent gravel and 10 percent cobbles; medium acid (pH 6.0); gradual irregular boundary.

R—10 inches; highly weathered granite.

The mean annual soil temperature is 50 to 56 degrees F. The solum is 5 to 13 inches thick and is strongly acid to mildly alkaline. It averages more than 35 percent rock fragments. Depth to bedrock is less than 16 inches.

The A1 horizon has value of 4 to 6 when dry and 3 or 4 when moist, and it has chroma of 2 to 6. It is loamy sand, sandy loam, or sandy clay loam and is 10 to 45 percent gravel and 5 to 20 percent cobbles and stones. The A3 horizon has value of 3 to 6 when dry and 3 or 4 when moist, and it has chroma of 2 to 6. It is sandy loam or clay loam and is 20 to 40 percent gravel and 0 to 50 percent cobbles and stones.

The C horizon, where present, has hue of 7.5YR to 10YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 3 to 6. It is sandy loam, sandy clay loam, or loamy sand and is 30 to 70 percent gravel and 0 to 20 percent cobbles and stones.

Lithic Ustorthents, moist

Lithic Ustorthents, moist, are shallow, well drained soils that formed in residuum derived from rhyolite, granite, and conglomerate. These soils are in uneven mountainous areas. Slope is 1 to 80 percent. Elevation is about 5,200 feet. The mean annual precipitation is about 10 to 18 inches, and the mean annual air temperature is about 52 to 57 degrees F.

Reference pedon of Lithic Ustorthents, moist, in the SW1/4SW1/4 of sec. 7, T. 17 S., R. 17 W.

A11—0 to 3 inches; pale brown (10YR 6/3) very stony sandy loam, dark brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many fine interstitial pores; about 30 percent gravel, 10 percent cobbles, and 15 percent stones; slightly acid (pH 6.1); clear smooth boundary.

A12—3 to 10 inches; yellowish brown (10YR 5/4) very cobbly sandy loam, dark brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many fine interstitial pores; about 20 percent gravel and 20 percent cobbles; slightly acid (pH 6.2); clear wavy boundary.

C—10 to 17 inches; light yellowish brown (10YR 6/4) cobbly sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; few fine interstitial pores; about 20 percent cobbles; medium acid (pH 5.9); clear wavy boundary.

R—17 inches; fractured rhyolite.

The mean annual soil temperature is 50 to 56 degrees F. The solum is 2 to 10 inches thick and is strongly acid to neutral. Depth to bedrock is 4 to 19 inches.

The A1 horizon has value of 4 to 7 when dry and 3 to 5 when moist, and it has chroma of 2 to 4. It ranges from sandy loam to sandy clay loam or loam and is 15 to 50 percent gravel, 0 to 20 percent cobbles, and 0 to 15 percent stones.

The C horizon, where present, has value of 4 to 8 when dry and 3 to 6 when moist, and it has chroma of 2 to 6. It is 20 to 50 percent gravel, 0 to 20 percent cobbles, and 0 to 10 percent stones.

Typic Haplustalfs, fine, mixed, mesic

Typic Haplustalfs, fine, mixed, mesic, are moderately deep and deep, well drained soils that formed in old alluvium and residuum derived from granite, rhyolite, and conglomerate. These soils are on alluvial plains and in uneven and smooth mountainous areas. Slope is 1 to 80 percent. Elevation is about 5,900 feet. The mean annual precipitation is about 12 to 14 inches, and the mean annual air temperature is about 52 to 57 degrees F.

Reference pedon of Typic Haplustalfs, fine, mixed, mesic, in the SW1/4SE1/4 of sec. 31, T. 20 S., R. 16 W.

A1—0 to 3 inches; brown (7.5YR 4/2) very gravelly clay loam, dark brown (7.5YR 3/4) moist; weak fine granular structure; slightly hard, very friable, sticky and plastic; common very fine roots; common very fine and fine interstitial pores; about 30 percent gravel, 10 percent cobbles, and a few stones; slightly acid (pH 6.5); abrupt smooth boundary.

B21t—3 to 8 inches; reddish brown (5YR 4/4) gravelly clay, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and few medium roots; few very fine and fine interstitial and tubular pores; few thin clay films on peds; about 25 percent gravel; slightly acid (pH 6.2); clear smooth boundary.

B22t—8 to 17 inches; yellowish red (5YR 5/6) gravelly sandy clay, yellowish red (5YR 4/6) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; few very fine, fine, and medium roots; few very fine and fine interstitial and tubular pores; common thin clay films on peds; about 25 percent gravel; medium acid (pH 5.7); gradual wavy boundary.

C—17 to 26 inches; brown (7.5YR 5/4) very gravelly sandy loam, strong brown (7.5YR 4/6) moist; massive; hard, friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial and tubular pores; about 50 percent gravel; medium acid (pH 5.8); diffuse wavy boundary.

R—26 inches; granite.

The mean annual soil temperature is 54 to 59 degrees F. The solum is 17 to 39 inches thick and is strongly acid to mildly alkaline. Depth to bedrock is 20 to 60 inches or more.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 6. It ranges from sandy loam to clay loam and is 5 to 30 percent gravel and 0 to 25 percent cobbles and stones.

The B1 horizon, where present, has chroma of 3 or 4. The Bt horizon has hue of 5YR to 10YR, value of 4 or 5 when dry and 3 to 5 when moist, and chroma of 3 to 6. It ranges from sandy clay to clay and is 5 to 25 percent gravel. The B3 horizon, where present, has value of 4 or 5 when dry.

The C horizon has hue of 5YR or 7.5YR. It is sandy loam or sandy clay loam and is 5 to 50 percent gravel.

Typic Ustipsamments, mixed, mesic

Typic Ustipsamments, mixed, mesic, are deep, well drained soils that formed in alluvium derived from granite, rhyolite, and conglomerate. These soils are on alluvial fans and flood plains. Slope is 1 to 10 percent. Elevation is about 5,500 feet. The mean annual precipitation is about 10 to 14 inches, and the mean annual air temperature is about 52 to 57 degrees F.

Reference pedon of Typic Ustipsamments, mixed, mesic, in the NW1/4SE1/4 of sec. 36, T. 21 S., R. 17 W.

A11—0 to 2 inches; brown (10YR 5/3) gravelly loamy sand, dark brown (10YR 3/3) moist; weak fine platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; about 30 percent gravel; slightly acid (pH 6.4); clear smooth boundary.

A12—2 to 8 inches; yellowish brown (10YR 5/4) gravelly loamy sand, dark yellowish brown (10YR 3/4) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial pores; about 30 percent gravel; neutral (pH 6.6); clear wavy boundary.

C1—8 to 16 inches; yellowish brown (10YR 5/4) gravelly sand, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine interstitial pores; about 30 percent gravel; neutral (pH 6.8); clear wavy boundary.

C2—16 to 21 inches; yellowish brown (10YR 5/4) gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine interstitial pores; about 30 percent gravel; neutral (pH 6.6); clear wavy boundary.

C3—21 to 39 inches; yellowish brown (10YR 5/4) gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; about 30 percent gravel; neutral (pH 7.0); gradual wavy boundary.

C4—39 to 52 inches; yellowish brown (10YR 5/4) extremely gravelly sand, dark yellowish brown (10YR 4/4) moist; massive; loose, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; about 70 percent gravel; neutral (pH 7.0); gradual wavy boundary.

C5—52 to 60 inches; yellowish brown (10YR 5/4) extremely gravelly sand, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; about 60 percent gravel; neutral (pH 6.9).

The mean annual soil temperature is 54 to 59 degrees F. The solum is 2 to 30 inches thick and is slightly acid to moderately alkaline. Depth to bedrock is more than 60 inches.

The A horizon has value of 4 to 6 when dry and 3 or 4 when moist, and it has chroma of 3 or 4. It ranges from sand to sandy loam and is 5 to 30 percent gravel and 0 to 5 percent cobbles.

The C1 horizon has value of 5 or 6 when dry and 3 or 4 when moist. It ranges from sand to loamy fine sand and is 5 to 30 percent gravel and 0 to 5 percent cobbles. The C2 horizon has value of 4 to 6 when dry and 3 or 4 when moist, and it has chroma of 3 to 6. It ranges from coarse sand to loamy sand and is 5 to 30 percent gravel and 0 to 5 percent cobbles. The C3 horizon, where present, has value of 3 or 4 when moist, and it has chroma of 3 or 4. It ranges from loamy sand to clay loam and is 0 to 30 percent gravel. The C4 and C5 horizons, where present, have value of 5 or 6 when dry. They are 50 to 70 percent gravel.

The IIC1 horizon, where present, has chroma of 2 or 3. It is 15 to 30 percent gravel.

Typic Ustorthents

Typic Ustorthents are moderately deep and deep, well drained soils that formed in material weathered from granite, rhyolite, and conglomerate. These soils are in uneven mountainous areas. Slope is 40 to 80 percent. Elevation is about 5,400 feet. The mean annual precipitation is about 10 to 14 inches, and the mean annual air temperature is about 52 to 57 degrees F.

Reference pedon of Typic Ustorthents in sec. 24, T. 18 S., R. 16 W.

A1—0 to 4 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; about 40 percent gravel; noneffervescent; moderately alkaline (pH 7.9); clear smooth boundary.

C1—4 to 19 inches; very pale brown (10YR 7/3) very cobbly sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; few very fine interstitial pores; about 15 percent gravel and 20 percent cobbles; common large irregular masses of disseminated lime; violently effervescent; moderately alkaline (pH 8.0); clear smooth boundary.

C2—19 to 32 inches; light brown (7.5YR 6/4) very cobbly sandy loam, brown (7.5YR 5/4) moist; massive; hard, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; few very fine interstitial pores; about 20 percent gravel and 15 percent cobbles; common fine irregular soft masses of lime; strongly effervescent; moderately alkaline (pH 7.9); clear wavy boundary.

R—32 inches; bedrock.

The mean annual soil temperature is 54 to 59 degrees F The solum is 4 to 32 inches thick and is strongly acid to moderately alkaline. Depth to bedrock is 20 to 60 inches or more.

The A1 horizon has value of 3 to 6 when dry and 3 or 4 when moist, and it has chroma of 2 to 6. It ranges from sandy loam to loam and is 5 to 65 percent gravel, 0 to 15 percent cobbles, and 0 to 10 percent stones. The A3 horizon, where present, is as much as 40 percent gravel and 10 percent cobbles.

The C horizon has hue of 7.5YR or 10YR, value of 5 to 7 when dry and 3 to 5 when moist, and chroma of 3 to 6. It ranges from coarse loamy sand to sandy loam and is 15 to 70 percent gravel and 0 to 25 percent cobbles.

Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic

Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, are moderately deep and deep, well drained soils that formed in residuum and colluvium derived from granite, gneiss, rhyolite, and conglomerate. These soils are in smooth to uneven mountainous areas. Slope is 15 to 40 percent. Elevation is about 5,600 feet. The mean annual precipitation is 10 to 14 inches, and the mean annual air temperature is 52 to 57 degrees F

Reference pedon of Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, in the NE1/4SE1/4 of sec. 24, T. 18 S., R. 16 W.

A11—0 to 2 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few fine roots; common fine interstitial pores; 55 percent gravel; violently effervescent; mildly alkaline (pH 7.8); clear smooth boundary.

A12—2 to 7 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine interstitial pores; 20 percent gravel; violently effervescent; moderately alkaline (pH 7.9); clear smooth boundary.

C1ca—7 to 28 inches; pale brown (10YR 6/3) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine interstitial pores; 30 percent gravel and 5 percent cobbles; common medium irregular soft masses of lime; violently effervescent; mildly alkaline (pH 7.9); diffuse wavy boundary.

C2ca—28 to 50 inches; very pale brown (10YR 7/3) very gravelly sandy loam, yellowish brown (10YR 5/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few fine interstitial pores; 30 percent gravel and 5 percent cobbles; many large irregular soft masses of lime; violently effervescent; moderately alkaline (pH 7.9); clear smooth boundary.

C3ca—50 to 60 inches; light yellowish brown (10YR 6/4) gravelly loamy sand, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine and fine interstitial pores; 30 percent gravel; violently effervescent; moderately alkaline (pH 7.9).

The mean annual soil temperature is 54 to 59 degrees F. The solum is 4 to 11 inches thick and is slightly acid to moderately alkaline. Depth to bedrock is 20 to 60 inches or more. The profile averages more than 35 percent rock fragments.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 when dry, and chroma of 2 to 4. It ranges from sandy loam to sandy clay loam and is 25 to 60 percent gravel, 0 to 10 percent cobbles, and 0 to 5 percent stones.

The B2 horizon, where present, has hue of 5YR to 10YR, and it has value of 4 or 5 when dry or moist. It ranges from sandy loam to sandy clay loam and is 25 to 30 percent gravel and 0 to 5 percent cobbles.

The C horizon has hue of 5YR to 10YR, value of 4 to 7 when dry and 4 or 5 when moist, and chroma of 4 to 6. It ranges from loamy sand to sandy loam and is 15 to 60 percent gravel and 0 to 25 percent cobbles.

Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist

Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist, are moderately deep and deep, well drained soils that formed in residuum and colluvium derived from granite, gneiss, and rhyolite. These soils are in uneven mountainous areas. Slope is 40 to 80 percent. Elevation is about 5,300 feet. The mean annual precipitation is 14 to 16 inches, and the mean annual air temperature is 48 to 54 degrees F.

Reference pedon of Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist, in the SW1/4NW1/4 of sec. 12, T. 18 S., R. 17 W.

A11—0 to 2 inches; yellowish brown (10YR 5/4) very cobbly sandy loam, dark brown (10YR 3/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; about 25 percent gravel, 15 percent cobbles, and 5 percent stones; slightly acid (pH 6.1); abrupt smooth boundary.

A12—2 to 8 inches; yellowish brown (10YR 5/4) very cobbly sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; about 20 percent gravel and 20 percent cobbles; slightly acid (pH 6.2); gradual smooth boundary.

A13—8 to 27 inches; light brown (7.5YR 6/4) extremely cobbly sandy loam, brown (7.5YR 5/4) moist; moderate fine and medium granular structure; slightly hard, very friable, nonsticky and nonplastic; few fine and medium roots; about 20 percent gravel and 40 percent cobbles; medium acid (pH 5.8); gradual smooth boundary.

C—27 to 60 inches; very pale brown (10YR 7/4) extremely stony fine loamy sand, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; about 20 percent gravel, 20 percent cobbles, and 20 percent stones; strongly acid (pH 5.4).

The mean annual soil temperature is 50 to 56 degrees F. The solum is 4 to 44 inches thick and is medium acid to moderately alkaline. Depth to bedrock is 22 to 60 inches or more.

The A11 horizon has hue of 7.5YR or 10YR, value of 3 to 5 when moist, and chroma of 3 to 8. It ranges from sandy loam to sandy clay loam and is 25 to 55 percent gravel and 5 to 15 percent cobbles and stones. The A12 horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist, and chroma of 3 to 6. It is 20 to 50 percent gravel and 5 to 30 percent cobbles and stones. The A13 horizon has hue of 7.5YR or 10YR, and it has value of 5 or 6 when dry and 4 or 5 when moist. It is 20 to 60 percent gravel and 10 to 40 percent cobbles.

The C1 horizon has value of 4 to 7 when dry and 4 or 5 when moist, and it has chroma of 3 to 6. It ranges from fine sandy loam to sandy clay loam and is 20 to 60 percent gravel and 0 to 20 percent cobbles and stones. The C2 horizon, where present, has chroma of 3 to 6. It is 0 to 20 percent gravel and 0 to 5 percent cobbles.

Udic Ustochrepts, coarse-loamy, mixed, mesic

Udic Ustochrepts, coarse-loamy, mixed, mesic, are moderately deep and deep, well drained soils that formed in residuum and alluvium derived from granite. These soils are on low hills and alluvial plains. Slope is 1 to 15 percent. Elevation is about 6,000 feet. The mean annual precipitation is 14 to 18 inches, and the mean annual air temperature is 48 to 54 degrees F.

Reference pedon of Udic Ustochrepts, coarse-loamy, mixed, mesic, in the SW1/4NE1/4 of sec. 4, T. 20 S., R. 15 W.

A11—0 to 5 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine roots; few fine interstitial pores; about 5 percent gravel; neutral (pH 6.6); clear smooth boundary.

A12—5 to 9 inches; pale brown (10YR 6/3) sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine roots; few fine interstitial pores; about 5 percent gravel; neutral (pH 6.8); clear smooth boundary.

B2—9 to 20 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and medium roots; few fine interstitial pores; about 5 percent gravel; medium acid (pH 5.9); abrupt smooth boundary.

C1—20 to 40 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; hard, firm, nonsticky and nonplastic; few fine and medium roots; few fine interstitial and tubular pores; about 10 percent gravel; neutral (pH 6.7); gradual wavy boundary.

C2—40 to 60 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine and medium roots; few fine interstitial and tubular pores; about 10 percent gravel; neutral (pH 6.7).

The mean annual soil temperature is 50 to 56 degrees F. The solum is 10 to 48 inches thick and is medium acid to neutral. Depth to bedrock is 20 to 60 inches or more. Some pedons have an A3 or C3 horizon.

The A horizon has value of 5 or 6 when dry and 3 or 4 when moist, and it has chroma of 3 or 4. It ranges from sand to sandy loam and is 0 to 5 percent gravel.

The B2 horizon has value of 5 or 6 when dry and 3 or 4 when moist, and it has chroma of 3 or 4. It is sandy loam or sandy clay loam and is 0 to 10 percent gravel.

The C1 horizon has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 3 to 8. It is 0 to 30 percent gravel. The C2 horizon has value of 4 or 5 when moist. It is 5 to 10 percent gravel.

Ustorthents

Ustorthents are shallow to deep, well drained soils that formed in material weathered from conglomerate, granite, and rhyolite. These soils are on low hillsides, mountainsides, and canyonsides. Slope is 12 to 80 percent. Elevation is about 5,500 feet. The mean annual precipitation is 12 to 14 inches, and the mean annual air temperature is 52 to 57 degrees F.

Reference pedon of Ustorthents in the SW1/4NW1/4 of sec. 11, T. 17 S., R. 17 W.

A11—0 to 2 inches; yellowish brown (10YR 5/4) extremely gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few fine interstitial pores; about 65 percent gravel and a few cobbles; medium acid (pH 5.6); abrupt smooth boundary.

A12—2 to 7 inches; yellowish brown (10YR 5/4) extremely gravelly sandy loam, dark brown (10YR 4/3) moist; weak very fine and fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few fine and common very fine roots; few fine interstitial pores; about 70 percent gravel; slightly acid (pH 6.5); clear smooth boundary.

C—7 to 12 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; few fine interstitial and tubular pores; about 80 percent gravel; slightly acid (pH 6.4); clear wavy boundary.
R—12 inches; conglomerate.

The mean annual soil temperature is 54 to 59 degrees F. The solum is 7 to 9 inches thick and is strongly acid to mildly alkaline. Depth to bedrock is 5 to 60 inches or more.

The A horizon has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 2 to 4. It is 20 to 70 percent gravel, 0 to 40 percent cobbles, and 0 to 15 percent stones.

The C horizon, where present, has value of 4 to 7 when dry and 4 to 6 when moist, and it has chroma of 3 to 6. It is 25 to 80 percent gravel and 0 to 5 percent cobbles.

Tables

TABLE 1.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
74	Aridic Haplustalfs, fine, mixed, mesic-Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic association, 15 to 40 percent slopes	5,726	3.4
75	Aridic Haplustalfs-Typic Ustorthents association, 40 to 80 percent slopes	2,378	1.4
76	Cumulic Haplustolls-Aridic Haplustalfs complex, 1 to 15 percent slopes	1,179	0.7
77	Lithic Haploborolls, loamy, mixed, warm, 1 to 15 percent slopes	573	0.3
78	Lithic Haploborolls, loamy, mixed, warm, 15 to 40 percent slopes	2,097	1.3
79	Lithic Haploborolls, warm, 40 to 80 percent slopes	1,731	1.0
80	Lithic Haplustalfs, dry-Aridic Haplustalfs complex, 15 to 40 percent slopes	2,896	1.7
81	Lithic Haplustalfs, dry-Aridic Haplustalfs complex, 40 to 80 percent slopes	20,938	12.5
82	Lithic Haplustalfs, dry-Lithic Ustorthents, moist association, 40 to 80 percent slopes	16,142	9.7
83	Lithic Haplustalfs, loamy-skeletal, mixed, mesic-Lithic Haplustolls, loamy-skeletal, mixed, mesic complex, moist, 15 to 40 percent slopes	34,318	20.6
84	Lithic Haplustolls, loamy skeletal, mixed, mesic-Typic Haplustalfs, fine, mixed, mesic complex, 40 to 80 percent slopes	17,649	10.6
85	Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic-Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic complex, moist, 40 to 80 percent slopes	9,136	5.5
86	Rock outcrop-Ustorthents-Haplustolls complex, 25 to 100 percent slopes	1,384	0.8
87	Typic Haplustalfs, fine, mixed, mesic-Lithic Haplustolls, loamy-skeletal, mixed, mesic complex, 1 to 15 percent slopes	12,643	7.6
88	Typic Haplustalfs, fine, mixed, mesic-Lithic Haplustolls, loamy-skeletal, mixed, mesic complex, 15 to 40 percent slopes	28,190	16.9
89	Typic Ustipsamments, mixed, mesic-Cumulic Haplustolls, coarse-loamy, mixed, mesic complex, 1 to 10 percent slopes	4,932	3.0
90	Udic Ustochrepts, coarse-loamy, mixed, mesic-Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist complex, 1 to 15 percent slopes	4,988	3.0
	Total	166,900	100.0

TABLE 2.--RANGELAND PRODUCTIVITY AND POTENTIAL NATURAL VEGETATION

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Average annual production		Potential natural vegetation	Composition
	Forage (air-dry)	Herbage (air-dry)		
	Lb/acre/year	Lb/acre/year		Pct
74*:				
Aridic Haplustalfs, fine, mixed, mesic	600	600	Blue grama	20
			Sideoats grama	20
			Black grama	20
			Sacahuista	15
			Galleta	10
			Muhly	10
			Acacia	5
Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic.				
75*:				
Aridic Haplustalfs	350	400	Blue grama	20
			Sideoats grama	20
			Black grama	20
			Sacahuista	15
			Galleta	10
			Muhly	10
			Acacia	5
Typic Ustorthents.				
76*:				
Cumulic Haplustolls	1,000	1,000	Blue grama	30
			Sacahuista	15
			Mesquite	10
			Sideoats grama	10
			Black grama	10
			Soaptree yucca	5
			Mormon-tea	5
			Datil yucca	5
			Turpentinebush	5
			Sand dropseed	5
Aridic Haplustalfs	600	600	Blue grama	20
			Sideoats grama	20
			Black grama	20
			Sacahuista	15
			Galleta	10
			Muhly	10
			Acacia	5
80*:				
Lithic Haplustalfs, dry	250	300	Blue grama	25
			Sideoats grama	20
			Black grama	20
			Sacahuista	15
			Galleta	10
			Pricklypear	5
			Sotol	5
Aridic Haplustalfs	600	600	Blue grama	20
			Sideoats grama	20
			Black grama	20
			Sacahuista	15
			Galleta	10
			Muhly	10
			Acacia	5

See footnote at end of table.

TABLE 2.--RANGELAND PRODUCTIVITY AND POTENTIAL NATURAL VEGETATION--Continued

Soil name and map symbol	Average annual production		Potential natural vegetation	Composition
	Forage (air-dry)	Herbage (air-dry)		
	Lb/acre/year	Lb/acre/year		
81*:				
Lithic Haplustalfs, dry----------	300	300	Blue grama----------	25
			Sideoats grama----------	20
			Black grama----------	20
			Sacahuista----------	15
			Galleta----------	10
			Pricklypear----------	5
			Sotol----------	5
Aridic Haplustalfs----------	400	400	Blue grama----------	20
			Sideoats grama----------	20
			Black grama----------	20
			Sacahuista----------	15
			Galleta----------	10
			Muhly----------	10
			Acacia----------	5
82*:				
Lithic Haplustalfs, dry----------	200	200	Blue grama----------	25
			Sideoats grama----------	20
			Black grama----------	20
			Sacahuista----------	15
			Galleta----------	10
			Pricklypear----------	5
			Sotol----------	5
Lithic Ustorthents, moist.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 3.--WOODLAND PRODUCTIVITY

[Only the soils suitable for production of trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Potential productivity		
	Common trees	Site index	Cords per acre
74*:			
Aridic Haplustalfs, fine, mixed, mesic.			
Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic	Alligator juniper	20	2
	Gray oak	---	---
75*:			
Aridic Haplustalfs.			
Typic Ustorthents	Oneseed juniper	15	1
	Gray oak	---	---
	Alligator juniper	20	2
77*, 78*	Ponderosa pine	40	---
Lithic Haploborolls, loamy, mixed, warm	Alligator juniper	15	1
79*	Ponderosa pine	40	---
Lithic Haploborolls, warm	Alligator juniper	15	1
82*:			
Lithic Haplustalfs, dry.			
Lithic Ustorthents, moist	Pinyon	30	2
	Alligator juniper	30	2
	Gray oak	---	---
83*:			
Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist	Pinyon	40	3
	Alligator juniper	40	3
	Gray oak	---	---
Lithic Haplustolls, loamy-skeletal, mixed, mesic, moist	Pinyon	40	3
	Alligator juniper	40	3
	Gray oak	---	---
84*:			
Lithic Haplustolls, loamy-skeletal, mixed, mesic	Alligator juniper	30	3
	Gray oak	---	---
Typic Haplustalfs, fine, mixed, mesic	Alligator juniper	30	3
	Gray oak	---	---
85*:			
Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist	Pinyon	30	3
	Alligator juniper	20	2
Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist	Pinyon	30	3
	Alligator juniper	20	2
	Gray oak	---	---
86*:			
Rock outcrop.			

See footnote at end of table.

TABLE 3.--WOODLAND PRODUCTIVITY--Continued

Soil name and map symbol	Potential productivity		
	Common trees	Site index	Cords per acre
Ustorthents	Alligator juniper	---	---
	Gray oak	---	---
Haplustolls	Alligator juniper	---	---
	Gray oak	---	---
87*, 88*:			
Typic Haplustalfs, fine, mixed, mesic	Alligator juniper	40	4
	Gray oak	---	---
Lithic Haplustolls, loamy-skeletal, mixed, mesic	Alligator juniper	40	4
	Gray oak	---	---
89*:			
Typic Ustipsamments, mixed, mesic	Alligator juniper	30	3
Cumulic Haplustolls, coarse-loamy, mixed, mesic	Alligator juniper	30	3
90*:			
Udic Ustochrepts, coarse-loamy, mixed, mesic	Pinyon	30	3
	Alligator juniper	30	3
	Gray oak	---	---
Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist	Pinyon	30	3
	Alligator juniper	30	3
	Gray oak	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 4.--WOODLAND UNDERSTORY VEGETATION

[Only the soils suitable for production of woodland understory are listed]

Soil name and map symbol	Total production (normal year)		Vegetation	Composition
	Forage (air-dry)	Herbage (air-dry)		
	Lb/acre	Lb/acre		Pct
74*:				
Aridic Haplustalfs, fine, mixed, mesic.				
Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic	250	400	Alligator juniper	20
			Gray oak	15
			Turbinella oak	15
			Sideoats grama	15
			Blue grama	15
			Oneseed juniper	5
			Wolftail	5
			New Mexico muhly	5
			Poverty threeawn	5
75*:				
Aridic Haplustalfs.				
Typic Ustorthents	150	300	Turbinella oak	20
			Alligator juniper	15
			Gray oak	15
			Blue grama	15
			Sideoats grama	15
			Oneseed juniper	5
			Wolftail	5
			New Mexico muhly	5
			Poverty threeawn	5
77*	250	600	Ponderosa pine	30
Lithic Haploborolls, loamy, mixed, warm			Alligator juniper	20
			Gambel oak	10
			Blue grama	10
			Gray oak	5
			Silverleaf oak	5
			Sideoats grama	5
			Bottlebrush squirreltail	5
			Pine dropseed	5
78*	200	600	Ponderosa pine	30
Lithic Haploborolls, loamy, mixed, warm			Alligator juniper	20
			Gambel oak	10
			Blue grama	10
			Gray oak	5
			Silverleaf oak	5
			Sideoats grama	5
			Bottlebrush squirreltail	5
			Pine dropseed	5
79*	100	600	Ponderosa pine	30
Lithic Haploborolls, warm			Alligator juniper	20
			Gambel oak	10
			Blue grama	10
			Gray oak	5
			Silverleaf oak	5
			Sideoats grama	5
			Bottlebrush squirreltail	5
			Pine dropseed	5

See footnote at end of table.

TABLE 4.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production (normal year)		Vegetation	Composition
	Forage (air-dry)	Herbage (air-dry)		
	Lb/acre	Lb/acre		Pct
82*:				
Lithic Haplustalfs, dry.				
Lithic Ustorthents, moist-----	100	200	Pinyon----------	25
			Alligator juniper----------	15
			Gray oak----------	10
			Turbinella oak----------	10
			Sideoats grama----------	10
			Oneseed juniper----------	5
			Wright silktassel----------	5
			Hairy mountainmahogany----------	5
			Blue grama----------	5
			Little bluestem----------	5
			Wolftail----------	5
83*:				
Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist----------	300	500	Pinyon----------	25
			Alligator juniper----------	20
			Gray oak----------	15
			Turbinella oak----------	5
			Oneseed juniper----------	5
			Blue grama----------	5
			Sideoats grama----------	5
			Wright silktassel----------	5
			Mountain muhly----------	5
			Longtongue muhly----------	5
			Wolftail----------	5
Lithic Haplustolls, loamy-skeletal, mixed, mesic, moist----------	325	500	Pinyon----------	25
			Alligator juniper----------	20
			Gray oak----------	15
			Turbinella oak----------	5
			Oneseed juniper----------	5
			Blue grama----------	5
			Sideoats grama----------	5
			Wright silktassel----------	5
			Mountain muhly----------	5
			Longtongue muhly----------	5
			Wolftail----------	5
84*:				
Lithic Haplustolls, loamy-skeletal, mixed, mesic-------	200	300	Alligator juniper----------	20
			Gray oak----------	20
			Blue grama----------	15
			Turbinella oak----------	15
			Sideoats grama----------	10
			Hairy mountainmahogany----------	5
			New Mexico muhly----------	5
			Wolftail----------	5
			Soaptree yucca----------	5
Typic Haplustalfs, fine, mixed, mesic----------	300	400	Alligator juniper----------	20
			Gray oak----------	20
			Blue grama----------	15
			Turbinella oak----------	15
			Sideoats grama----------	10
			Hairy mountainmahogany----------	5
			New Mexico muhly----------	5
			Wolftail----------	5
			Soaptree yucca----------	5

See footnote at end of table.

TABLE 4.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production (normal year)		Vegetation	Composition
	Forage (air-dry)	Herbage (air-dry)		
	Lb/acre	Lb/acre		Pct
85*				
Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic	75	200	Pinyon	25
			Alligator juniper	15
			Gray oak	10
			Turbinella oak	10
			Sideoats grama	10
			Oneseed juniper	5
			Hairy mountainmahogany	5
			Wolftail	5
			Little bluestem	5
			Muhly	5
			Blue grama	5
Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist	150	400	Pinyon	25
			Alligator juniper	20
			Gray oak	10
			Turbinella oak	10
			Oneseed juniper	5
			Wright silktassel	5
			Wolftail	5
			Sideoats grama	5
			Longtongue muhly	5
			Mountain muhly	5
			Blue grama	5
86*:				
Rock outcrop.				
Ustorthents	75	150	Gray oak	20
			Alligator juniper	20
			Turbinella oak	15
			Blue grama	15
			Hairy mountainmahogany	10
			Sideoats grama	10
			Wolftail	5
			New Mexico muhly	5
Haplustolls	75	150	Alligator juniper	20
			Gray oak	20
			Turbinella oak	15
			Blue grama	15
			Sideoats grama	10
			Hairy mountainmahogany	10
			Wolftail	5
			New Mexico muhly	5
87*, 88*:				
Typic Haplustalfs, fine, mixed, mesic	500	600	Alligator juniper	25
			Gray oak	20
			Blue grama	15
			Turbinella oak	10
			Sideoats grama	10
			Hairy mountainmahogany	5
			New Mexico muhly	5
			Wolftail	5
			Soaptree yucca	5

See footnote at end of table.

TABLE 4.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production (normal year)		Vegetation	Composition
	Forage (air-dry)	Herbage (air-dry)		
	Lb/acre	Lb/acre		Pct
87*, 88*:				
Lithic Haplustolls, loamy-skeletal, mixed, mesic	300	400	Alligator juniper	25
			Gray oak	20
			Blue grama	15
			Turbinella oak	10
			Sideoats grama	10
			Hairy mountainmahogany	5
			New Mexico muhly	5
			Wolftail	5
			Soaptree yucca	5
89*:				
Typic Ustipsamments, mixed, mesic	200	300	Blue grama	20
			Alligator juniper	15
			Desertwillow	15
			Arizona walnut	10
			Pricklypear	10
			Gray oak	5
			Sacahuista	5
			Soaptree yucca	5
			Saltbush	5
			Sideoats grama	5
			Sand dropseed	5
Cumulic Haplustolls, coarse-loamy, mixed, mesic	1,500	1,500	Blue grama	20
			Desertwillow	15
			Alligator juniper	15
			Arizona walnut	10
			Pricklypear	10
			Gray oak	5
			Sacahuista	5
			Soaptree yucca	5
			Saltbush	5
			Sideoats grama	5
			Sand dropseed	5
90*:				
Udic Ustochrepts, coarse-loamy, mixed, mesic	350	600	Pinyon	25
			Alligator juniper	20
			Gray oak	15
			Turbinella oak	15
			Sideoats grama	10
			Oneseed juniper	5
			Blue grama	5
			Wolftail	5
Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist	350	500	Pinyon	25
			Alligator juniper	20
			Gray oak	15
			Turbinella oak	5
			Oneseed juniper	5
			Blue grama	5
			Sideoats grama	5
			Wright silktassel	5
			Mountain muhly	5
			Longtongue muhly	5
			Wolftail	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 5.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "common," and "occasional" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
74*:										
Aridic Haplustalfs, fine, mixed, mesic	C	None	---	---	>6.0	---	---	20-60	Hard	Low.
Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic	B	None	---	---	>6.0	---	---	>60	Hard	Low.
75*:										
Aridic Haplustalfs	C	None	---	---	>6.0	---	---	>20	Hard	Low.
Typic Ustorthents	B	None	---	---	>6.0	---	---	>20	Hard	Low.
76*:										
Cumulic Haplustolls	B	Occasional	Very brief	Jul-Sep	>6.0	---	---	>60	---	Low.
Aridic Haplustalfs	C	None	---	---	>6.0	---	---	>20	Hard	Low.
77*, 78*	C	None	---	---	>6.0	---	---	<20	Hard	Moderate.
Lithic Haploborolls, loamy, mixed, warm.										
79*	C	None	---	---	>6.0	---	---	<20	Hard	Moderate.
Lithic Haploborolls, warm										
80*, 81*:										
Lithic Haplustalfs, dry	C	None	---	---	>6.0	---	---	<20	Hard	Low.
Aridic Haplustalfs	C	None	---	---	>6.0	---	---	>20	Hard	Low.
82*:										
Lithic Haplustalfs, dry	C	None	---	---	>6.0	---	---	<20	Hard	Low.
Lithic Ustorthents, moist	C	None	---	---	>6.0	---	---	<20	Hard	Low.
83*:										
Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist	C	None	---	---	>6.0	---	---	<20	Hard	Moderate.
Lithic Haplustolls, loamy-skeletal, mixed, mesic, moist	C	None	---	---	>6.0	---	---	<20	Hard	Low.

See footnote at end of table.

TABLE 5.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
84*:										
Lithic Haplustolls, loamy-skeletal, mixed, mesic, moist	C	None	---	---	>6.0	---	---	<20	Hard	Moderate.
Typic Haplustalfs, fine, mixed, mesic	D	None	---	---	>6.0	---	---	>20	Hard	Low.
85*:										
Lithic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist	C	None	---	---	>6.0	---	---	<20	Hard	Low.
Typic Ustorthents, loamy-skeletal, mixed, nonacid, mesic, moist	C	None	---	---	>6.0	---	---	>20	Hard	Low.
86*:										
Rock outcrop.										
Ustorthents	---	None	---	---	>6.0	---	---	>5	Hard	Low.
Haplustolls	---	None	---	---	>6.0	---	---	>5	Hard	Low.
87*, 88*:										
Typic Haplustalfs, fine, mixed, mesic	D	None	---	---	>6.0	---	---	>20	Hard	Low.
Lithic Haplustolls, loamy-skeletal, mixed, mesic	C	None	---	---	>6.0	---	---	<20	Hard	Moderate.
89*:										
Typic Ustipsamments, mixed, mesic	A	Common	Very brief	Jul-Sep	>6.0	---	---	>60	Soft	Low.
Cumulic Haplustolls, coarse-loamy, mixed, mesic	B	Rare	---	---	>6.0	---	---	>60	---	Low.
90*:										
Udic Ustochrepts, coarse-loamy, mixed, mesic	B	None	---	---	>6.0	---	---	>20	Hard	Low.
Lithic Haplustalfs, loamy-skeletal, mixed, mesic, moist	C	None	---	---	>6.0	---	---	<20	Hard	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3.5
Low	3.5 to 5.0
Moderate	5.0 to 7.5
High	7.5 to 10
Very high	More than 10

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bolson. A flat-floored desert valley that drains to a playa.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Congeliturbate. Soil material disturbed by frost action.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms. The Lco horizon is a limnic layer that contains many fecal pellets.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained; most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Saprolite (geology). Soft, earthy, clay-rich, thoroughly decomposed rock formed in place by chemical weathering of igneous and metamorphic rock. In soil science, saprolite is any unconsolidated residual material underlying the soil and grading to hard bedrock below.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In the survey the following slope classes are recognized:

	Percent
Nearly level	0 to 3
Gently sloping	1 to 9
Moderately sloping	5 to 17
Moderately steep	9 to 30
Very steep	20 to 75
Extremely steep	More than 75

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium absorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $Ca^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by melt water streams, in a glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

* U.S. GOVERNMENT PRINTING OFFICE: 1983 - 0-354-393 QL3

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