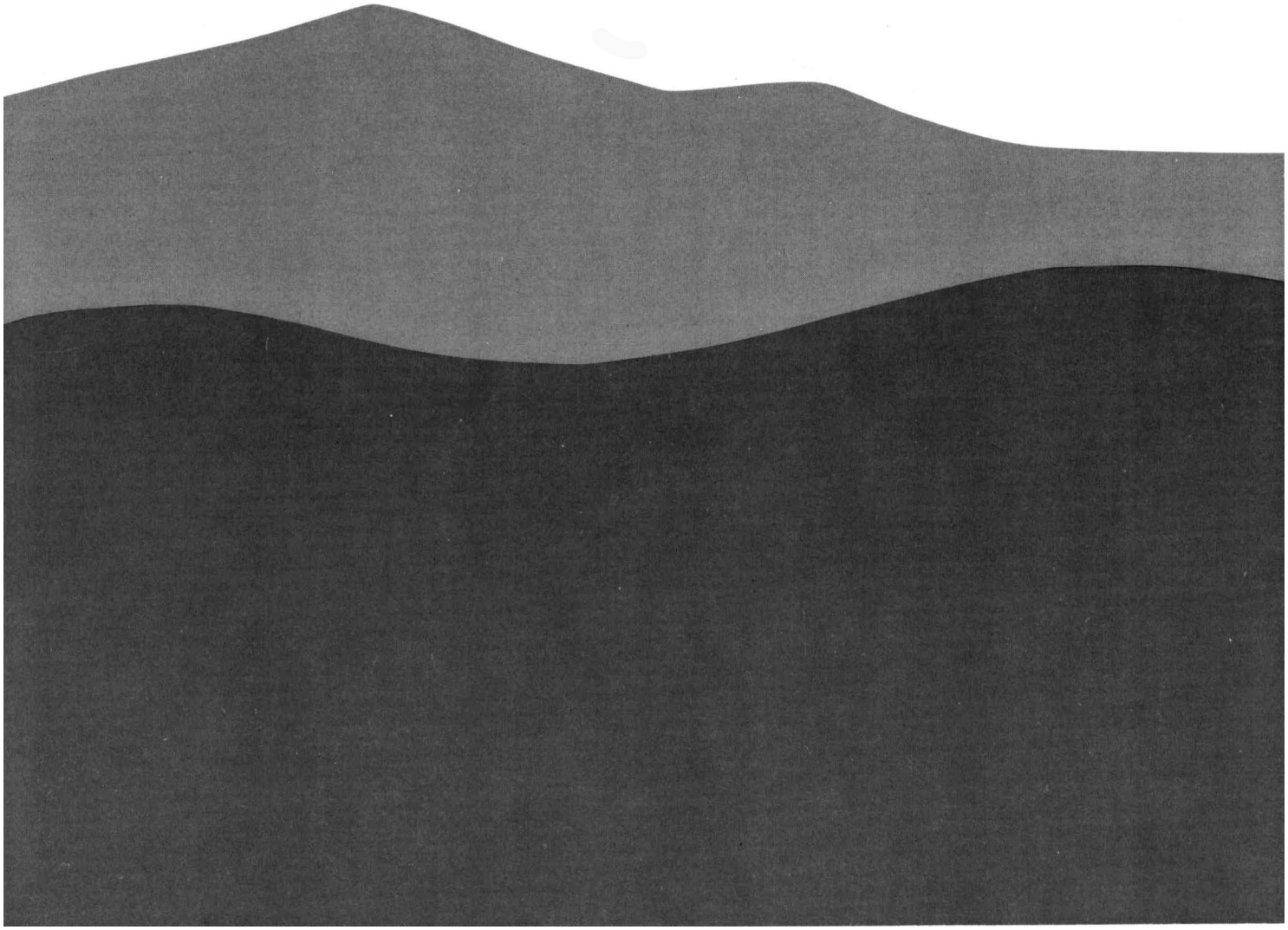
United States
Department of
Agriculture

Soil
Conservation
Service

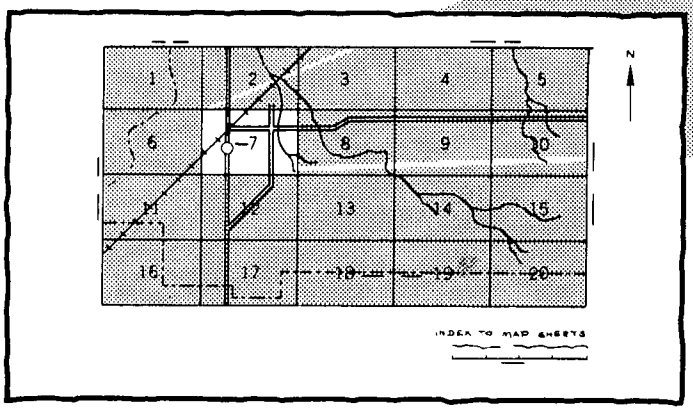
In cooperation with
United States Department of
Agriculture, Forest Service;
United States Department of
the Interior, Bureau of Land
Management and Bureau of
Indian Affairs; and
University of Nevada
Agricultural Experiment
Station

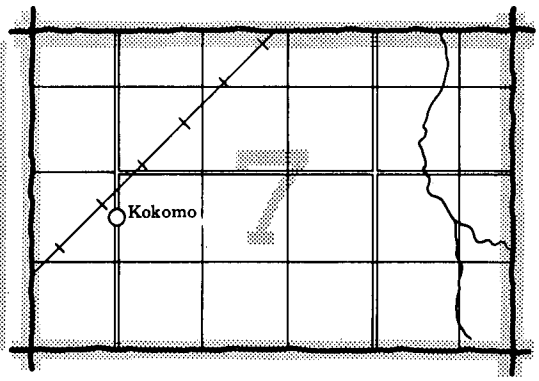
Soil Survey of Washoe County, Nevada, South Part



HOW TO USE

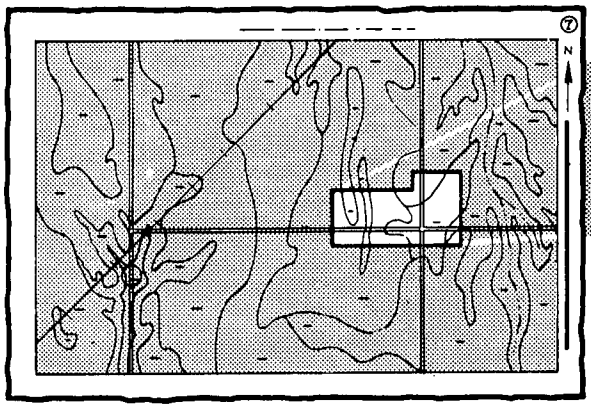
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

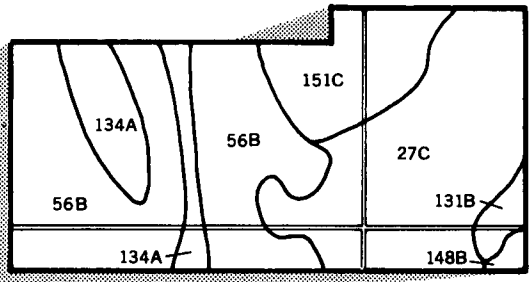




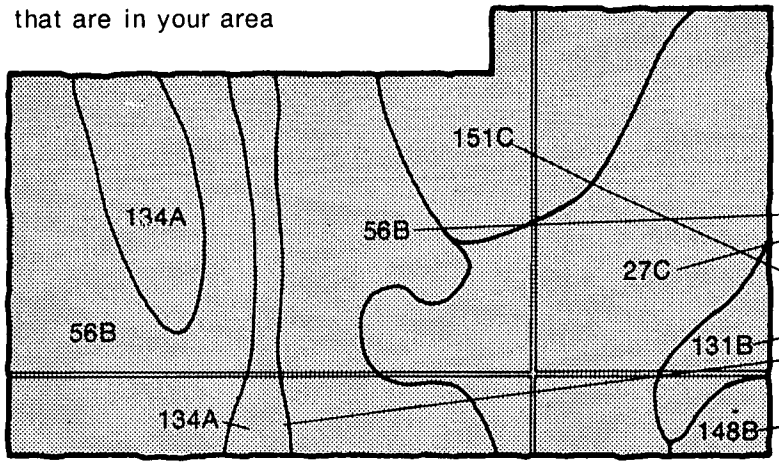
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area



Symbols

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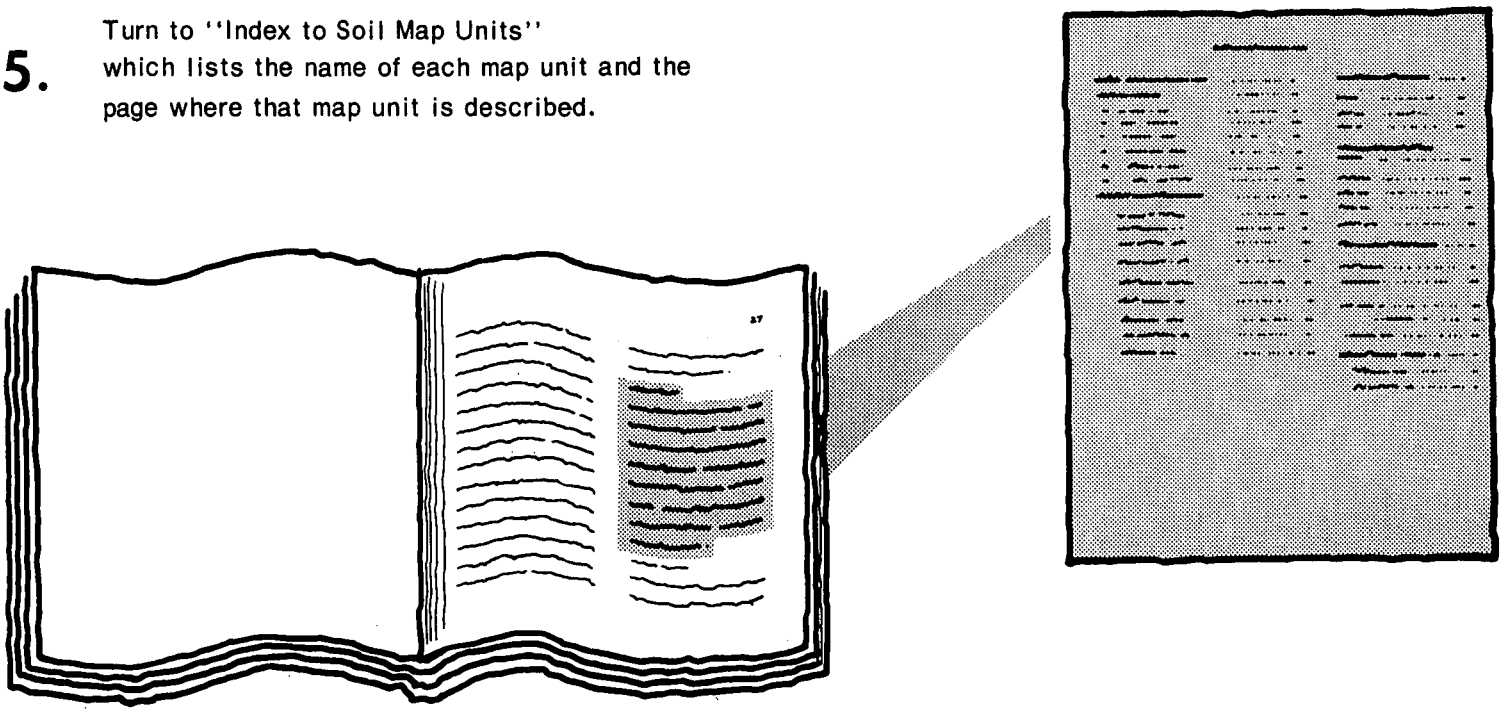
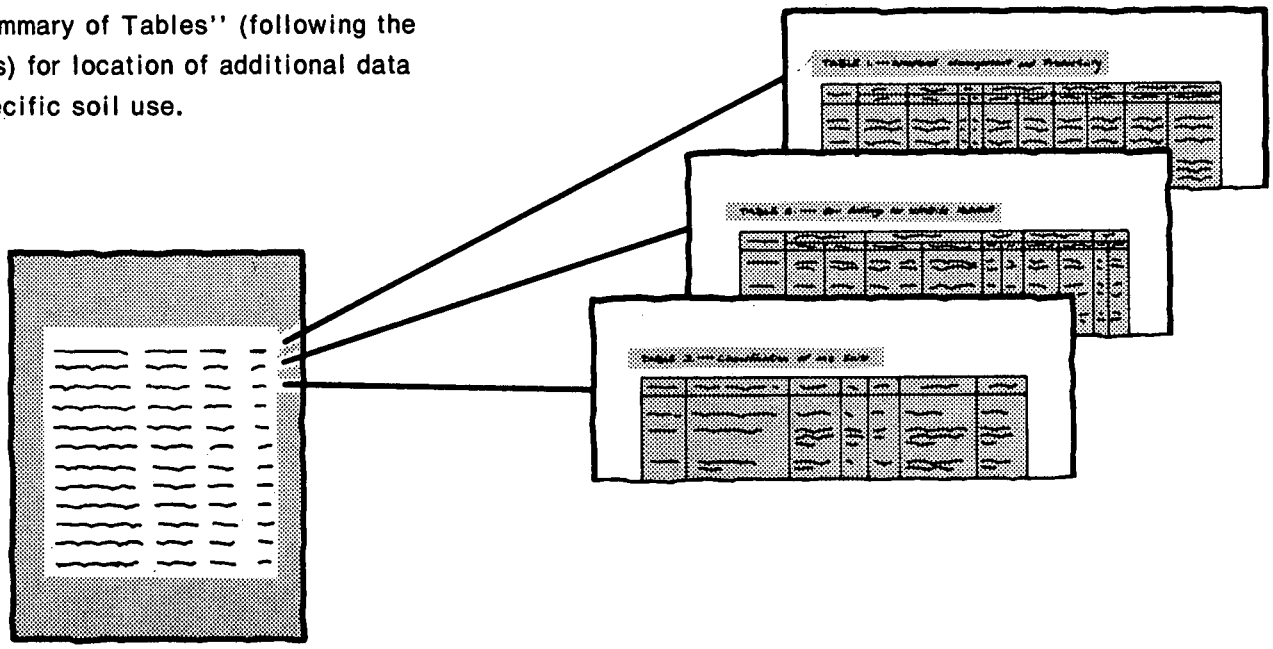
56B
131B
134A
148B
151C

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; for 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.

Major fieldwork for this soil survey was performed in the period 1970-79. Soil names and descriptions were approved in 1980. 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, the Forest Service, the Bureau of Land Management, the Bureau of Indian Affairs, and the University of Nevada Agricultural Experiment Station. It is part of the technical assistance furnished to the Washoe-Storey Conservation District.

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

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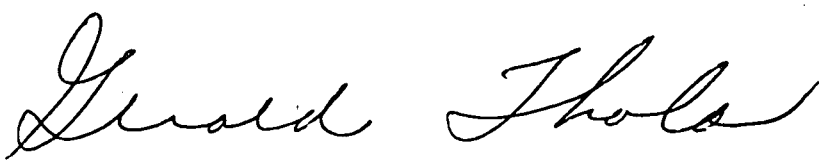
Foreword

This soil survey contains information that can be used in land-planning programs in Washoe County, Nevada, South Part. 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.



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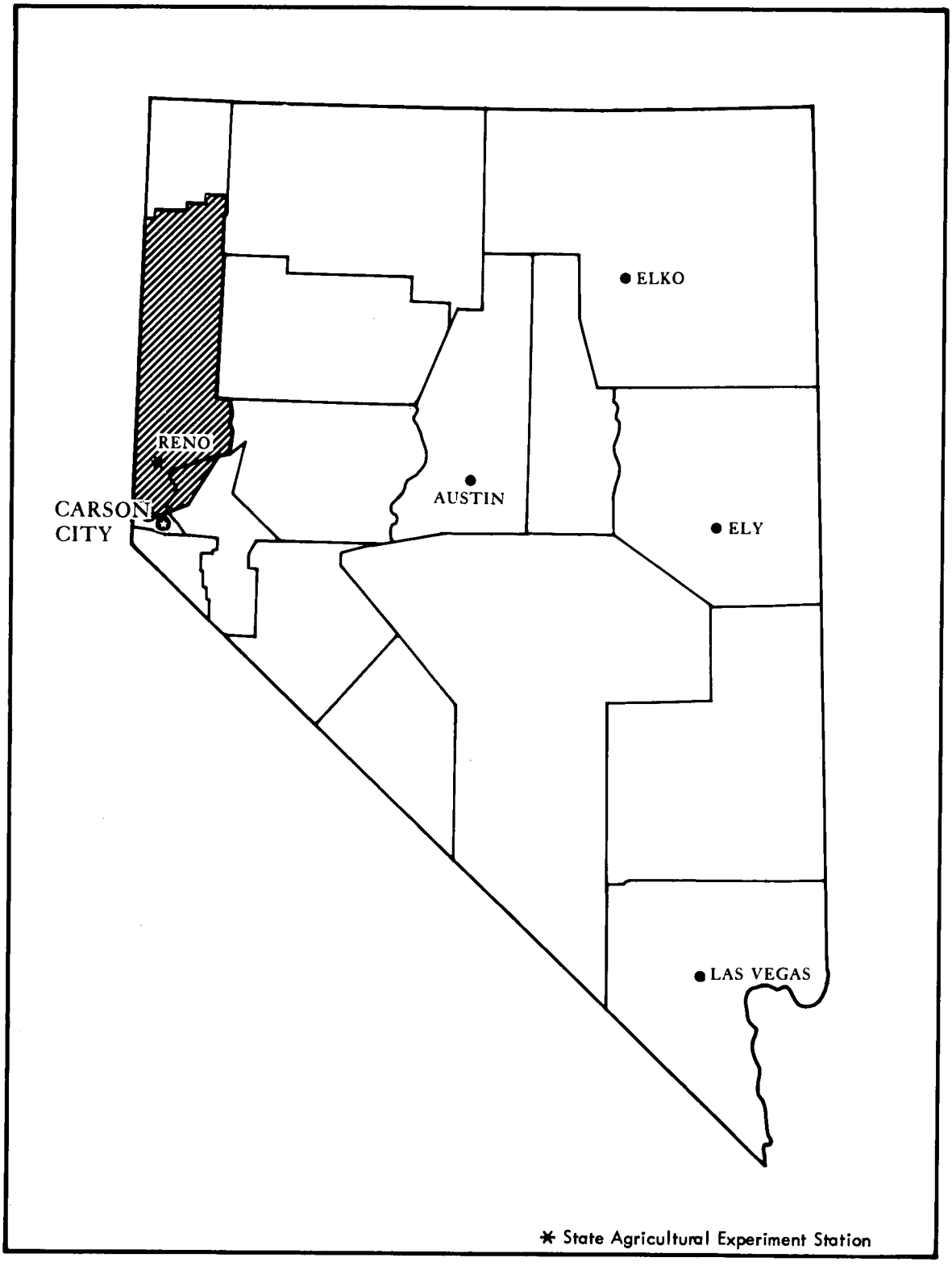

Location of Washoe County, South Part, in Nevada.

Soil Survey of Washoe County, Nevada, South Part

By Otto W. Baumer, Soil Conservation Service

Fieldwork by Otto W. Baumer, William E. Dollarhide, Leland I. Larsen, Edward W. Blake, Carole E. Jett, and John F. Fisher, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with the United States Department of Agriculture, Forest Service; the United States Department of the Interior, Bureau of Land Management and Bureau of Indian Affairs; and the University of Nevada Agricultural Experiment Station

WASHOE COUNTY, NEVADA, SOUTH PART, has a total land area of about 986,560 acres, or 1,542 square miles. Reno and Sparks are the largest cities in the survey area. Small towns in the area include Verdi, Washoe City, Bordertown, Nixon, Stead, and settlements or developments in almost all the valleys.

The survey area is located in the western fringe of the Basin and Range physiographic province. Numerous mountain ranges and intermountain valleys dominate the landscape. The Carson and Virginia Ranges are prominent in the area. The elevation of Mount Rose in the Carson Range at 10,778 feet and of Pyramid Lake at about 3,800 feet indicate the extremes in elevation. Valleys and basins include Washoe, Truckee Meadows, Spanish Springs, Hungry Valley, and Lemmon Valley. Landforms in the valleys include flood plains, alluvial fans, terraces, pediments, dunes, and playas. The mountains characteristically rise 2,000 to 4,000 feet above adjacent valleys.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey.

General Nature of the Survey Area

Richard MacDougall, district conservationist, Soil Conservation Service, helped write this section.

History

The survey area was inhabited by the Northern Nevada Paiute Indian Nation when the first explorers on record arrived. Exploring the area in 1843 and 1844, John C. Fremont discovered and named Pyramid Lake. In 1844, the Stephans-Townsend-Murphy group were the first settlers to pass through the survey area and cross the Sierras at Donner Summit. For over a decade following the Donner-Reed party tragedy in 1846, settlers arriving too late in the season to cross the Sierra Nevada spent the winter in the Truckee Meadows.

Permanent settlement began in 1852 when "Jamison's Station" was established near the present site of the Reno-Sparks sewage plant. Early settlers cut wild hay or raised wheat to support migration to the California gold fields, mining along the Comstock lode, and, in the 1860's, the construction of the Central Pacific Railroad east and west of Reno.

Early development of the area was based on the production of livestock and crops. Irrigation, introduced

in the late 1850's, brought a greater variety of crops—barley, oats, potatoes, vegetables, apples, peaches, plums, and berries.

Logging to supply timber for the Virginia City mines and firewood for Reno became important after the now abandoned Virginia and Truckee Railroad line was built between Reno and Virginia City. Logging has long since declined and currently accounts for a very minor part of the local economy.

In the early days, the railroad was very significant to the economy of the survey area. Huffaker's Station became a point of shipment for agricultural products and for the large amounts of timber and stovewood that were flumed down from the mountains to the west. With the decline of the Comstock lode, the railroad became less important and the economy of the area settled back to the true wealth of the region—the fertile meadowlands and abundant water supply. Farming and ranching continued to be the principal economic activities for many years. Since World War II, the growth of Reno and Sparks has resulted in the conversion of agricultural lands to subdivision and rural residential uses.

Water Supply

The major sources of irrigation water in the survey area are the Truckee River, Franktown Creek, Ophir Creek, Browns Creek, Galena Creek, Steamboat Creek, Whites Creek, and Thomas Creek. Wells have been drilled to supplement surface flow so that agriculture could expand into new areas such as Warm Springs Valley.

In the rural and suburban areas, water for household use is obtained from wells. Reno and Sparks and part of the adjacent county receive primarily treated water from the Truckee River. Small streams and deep wells also provide some water. A few outlying developed areas are supplied by private water companies that serve a few to several hundred customers.

The quality of the ground water is highly variable, and in some areas high levels of salts or toxic minerals make ground water unsuitable for household use.

Industries and Transportation

The main industries in the area are gaming-tourism, warehousing, agriculture, and light industry.

The economic base in the survey area is tourism, especially casino gaming and the complex of hotels, motels, and restaurants that supports the gaming industry. There is also some outdoor tourist activity, most notably skiing in the winter.

Of secondary importance is the warehouse industry, which has developed both because of the area's central location with respect to west coast markets and because of Nevada's "free port law", which exempts from taxation goods that are stored in the state.

Agriculture was once extensive in the meadows near the Truckee River but has declined greatly as a result of the growth of Reno and Sparks. Today, most farming is done on the fringes of the Truckee Meadows or in outlying valleys. In most of the sparsely populated outlying areas, the dominant agricultural activities are raising beef cattle and irrigated farming.

Light industries in the survey area are many and varied. They include manufacturing facilities for valves and regulators, skis, dog food, and gaming equipment.

The area is served by the Southern Pacific and Western Pacific Railroads. The Southern Pacific traverses the survey area east to west, paralleling the Truckee River. The Western Pacific runs from Reno to Sparks and connects with its main line in the vicinity of Hallelujah Junction. The two principal highways in the survey area are Interstate 80 running east to west, and U.S. 395 (I-580) running north to south. State highways and local all-weather roads provide ready access to nearly all sections of the survey area except the rugged mountainous reaches.

Major airlines provide regular scheduled service to the Cannon International Airport at Reno.

Geology

The geology of the survey area is variable and complex.

Most outcrops of pre-Tertiary rock in this area consist of plutonic rocks that range in composition from gabbro to quartz monzonite. The composition in most exposed intrusive masses approximates granodiorite. Typical soils that formed in parent material derived from these rocks are Acrelane, Corbett, and Witefels soils.

The metamorphic rock in the area includes both metasedimentary and metavolcanic rocks. These are the oldest rocks in the area and are mostly Jurassic in age. Flex soils formed in material derived from these rocks.

The volcanic rock in this area includes welded ash-flow tuffs, andesite flows, basalt, basaltic andesite, and other tuffs. These are part of the Hartford assemblage and range in age from early Miocene to early Pleistocene. These rocks are the most extensive in the area. The soils that formed in these materials include Arzo, Stingdorn, and Frodo soils.

The oldest valley fill is sediment of Tertiary age along the Truckee River and in Hungry Valley and Warm Springs Valley. It is mostly fluviolacustrine diatomite, siltstone, and tuff. These deposits are generally known as Coal Valley Formation. Soils such as Celeton Variant and Verdico soils formed in this sediment.

Many fans and terraces in the area are made up of older Quaternary alluvium. This alluvium is parent material for soils such as those of the Greenbrae, Godecke, and Bedell series.

The youngest material in the area is recent alluvium

along the flood plains of the Truckee River and streams in the area. Typical soils that formed in this material are those of the Notus, Voltaire, and Truckee series.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In Washoe County summers are hot, especially at lower elevations, and winters are cold. At lower elevations, precipitation is normally light during all months of the year, and land is mainly used for range. At higher elevations, precipitation is much greater and snow accumulates to considerable depths. Much of the snowmelt irrigates crops in nearby valleys.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Nixon, Reno, and Virginia City in the period 1951 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 34 degrees F, and the average daily minimum temperature is 23 degrees. The lowest temperature on record, which occurred at Nixon on December 9, 1972, is 22 degrees. In summer the average temperature is 68 degrees, and the average daily maximum temperature is 80 degrees at Virginia City and 89 degrees at Nixon. The highest recorded temperature, which occurred at Nixon on August 8, 1972, is 106 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, about 3 inches, or 30 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 2 inches. The heaviest 1-day rainfall during the period of record was 2.18 inches at Virginia City on January 20, 1969. Thunderstorms occur on about 13 days each year, and most occur in summer.

Average seasonal snowfall is 32 inches. The greatest snow depth at any one time during the period of record was 49 inches at Virginia City. On an average, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year. Every few years a blizzard strikes the survey area with high winds and much drifting snow. Even at lower elevations, snow remains on the ground for many weeks and livestock suffer.

The average relative humidity in midafternoon is about 30 percent. Humidity is higher at night, and the average at dawn is about 55 percent. The sun shines 90 percent of the time possible in summer and 70 percent in winter. The prevailing wind is from the west-northwest. Average windspeed is highest, 8 miles per hour, in April.

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.

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.

A number of map units in this survey area have soil names different from those in adjoining soil survey areas. The names in the Tahoe National Forest Area differ primarily because the soils in the two survey areas have small differences in base saturation, bulk density, organic matter, or other soil properties that affect the

classification of the soil. As a result of these small differences, soils that are in closely related families and are similar in use and management have been given different names. Some names in this survey differ from names in the Tahoe Basin Area because some soils have been reclassified since the Tahoe Basin Area was surveyed. The use and management are essentially the same. The Sierra Valley Area, California, and the Fallon-Fernley Area are older soil surveys, and the design of the map units for the intended use and management was different. Names in this survey and in the Carson City Area differ only where the proportion of soils in a unit changes near the survey boundary so that a named component in one area is only an inclusion in the other

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 eighteen map units in this survey area are grouped into six general kinds of landscapes for broad interpretive purposes. Each broad group and the map units in each group are described in the following pages.

Areas dominated by soils on flood plains and low terraces

Two map units are in this group. The soils in this group are on flood plains of rivers and streams, low terraces, and enclosed basins. Elevation is 3,800 to 5,200 feet. The average annual precipitation is 8 to 12 inches. The average annual air temperature is 47 to 52 degrees F, and the frost-free period is about 90 to 130 days.

These soils are nearly level. Most are very deep, but some are moderately deep. These soils are fine textured to moderately coarse textured throughout.

Most of the soils in this group have a seasonal high water table and are subject to rare flooding. Some of these soils, however, have a water table between 6 and 7 feet, and some are not subject to flooding.

1. Truckee-Voltaire-Vamp

Nearly level, very deep and moderately deep, very poorly drained to somewhat poorly drained soils; on alluvial fans, flood plains, and low terraces

This map unit is mainly in the western part of the survey area along the Truckee River, in the Truckee meadows, and on the western side of Washoe Valley. The vegetation is mainly sedges and other water-tolerant plants on the reclaimed areas and is saltgrass, rubber rabbitbrush, and black greasewood on the areas affected by salt and alkali. This unit makes up about 4 percent of the survey area.

The very deep Truckee soils are on flood plains. They formed under poorly drained conditions. The drainage has been altered. These soils are medium textured and moderately fine textured throughout. They are subject to rare flooding. They are nonsaline-alkali to strongly saline-alkali.

The very deep Voltaire soils are on alluvial fans and flood plains. They formed under poorly drained and very poorly drained conditions. The drainage has been altered in most of the area. These soils are moderately fine textured throughout. They are subject to rare flooding. They are nonsaline-alkali to strongly saline-alkali.

The moderately deep Vamp soils are on flood plains and low terraces and are somewhat poorly drained. These soils have a hardpan at a depth of 20 to 40 inches. They are moderately coarse textured above the hardpan. They are subject to rare flooding. They are slightly saline-alkali to strongly saline-alkali.

Of minor extent in this unit are Jubilee, Dressler, Settlemeyer, Sagouspe, Rose Creek, Idlewild, Updike, and Fleischmann soils. The Dressler, Jubilee, Sagouspe, Settlemeyer, and Rose Creek soils are on landscapes similar to those the major soils are on. The Idlewild and Updike soils are on slightly higher terraces and have a clayey subsoil. The Fleischmann soils are on high terrace remnants and are well drained.

This unit is used mainly for urban development, crops, pasture, and wildlife habitat.

The main limitations for urban development are flooding and the high water table. The main limitations for crops, pasture, and openland wildlife habitat are the high water table and salt and alkali. Use of the unit for wetland wildlife habitat is limited in areas where the water table has been lowered as a result of altered drainage.

2. Mellor-Updike-Godecke

Nearly level, very deep, somewhat poorly drained and moderately well drained soils; on low terraces and low-lying alluvial fans

This map unit is mainly in valleys in the western part of the survey area. The vegetation is mainly black

greasewood, saltgrass, shadscale, basin wildrye, and rubber rabbitbrush. This unit makes up about 3 percent of the survey area.

The moderately well drained Mellor soils are on low lake terraces and low-lying alluvial fans. These soils have a medium textured surface layer and a moderately fine textured subsoil. They are strongly saline-alkali in the lower part.

The moderately well drained Updike soils are on low lake terraces. These soils have a medium textured surface layer and a fine textured subsoil. They are moderately saline-alkali.

The somewhat poorly drained Godecke soils are on low terraces. These soils have a moderately coarse textured surface layer and a moderately fine textured subsoil. They are slightly to moderately saline-alkali.

Of minor extent in this unit are Doten, Dalzell, Parran, Cradlebaugh, Sagouspe, and Jowec soils and Playas. The Doten, Dalzell, and Jowec soils are on landscapes similar to those of the major soils. The Cradlebaugh and Sagouspe soils are on low-lying alluvial fans and flood plains. These soils have a seasonal high water table and are subject to flooding. The Parran soils and Playas are in basins.

This unit is used mainly for urban development and wildlife habitat.

The main limitations for urban development are the high clay content of most of the soils and the high water table. The main limitation to use as pasture is the salt and alkali content of the soils.

Areas dominated by dry soils on alluvial fans and terraces

Three map units are in this group. Most of the soils in this group are on alluvial fans and terraces in the eastern part of the survey area. Elevation is 3,800 to 6,000 feet. The average annual precipitation is 4 to 8 inches, the average annual temperature is 49 to 54 degrees F, and the frost-free period is about 100 to 130 days.

These soils are well drained to excessively drained and are shallow to very deep. They are nearly level to strongly sloping.

3. Isolde-Ruhe-Trocken

Nearly level to moderately steep, shallow and very deep, excessively drained and well drained soils; on sand dunes, lake terraces, and alluvial fans

This map unit is mostly in valleys in the eastern part of the survey area. The vegetation is mainly hairy horsebrush, winterfat, Bailey greasewood, and Indian ricegrass. This unit makes up about 5 percent of the survey area.

The nearly level to strongly sloping, excessively drained Isolde soils are on sand dunes. These soils are very deep and are coarse textured throughout. In some areas, these soils are underlain by silty lake deposits in the substratum.

The nearly level to strongly sloping, well drained Ruhe soils are on lake terraces. These soils are shallow over a tufa layer and are coarse textured.

The gently sloping to moderately steep, well drained Trocken soils are on alluvial fans. These soils are very deep, are moderately coarse textured, and are very gravelly throughout.

Of minor extent in this unit are Toulon soils, Bango soils, Duneland, and Beaches. The Toulon and Bango soils are on lake terraces.

This unit is mainly used as rangeland and for wildlife habitat. The main limitation for these uses is the very low precipitation.

4. Hawsley-Bluewing-Stumble

Gently sloping to strongly sloping, very deep, excessively drained and somewhat excessively drained soils; on alluvial fans and terraces

This map unit is mostly in valleys in the eastern part of the survey area. The vegetation is mainly Bailey greasewood, shadscale, bud sagebrush, and Indian ricegrass. This unit makes up about 4 percent of the survey area.

The gently sloping to moderately sloping, somewhat excessively drained Hawsley soils are on alluvial fans and terraces. These soils are very deep and are coarse textured throughout.

The gently sloping to strongly sloping, excessively drained Bluewing soils are on alluvial fans. These soils are very deep and are coarse textured and very gravelly throughout.

The moderately sloping to strongly sloping, somewhat excessively drained Stumble soils are on alluvial fans. These soils are very deep and are coarse textured throughout.

Of minor extent in this unit are Bango and Biddleman soils. The Bango and Biddleman soils are on lake terraces and have moderately fine textured subsoils.

This unit is used mainly as rangeland and for rangeland wildlife habitat. The main limitation for these uses is the very low precipitation.

5. Bundorf-Sutcliff-Rednik

Moderately sloping to strongly sloping, shallow to very deep, well drained soils; on dissected alluvial fans

This map unit is mostly in the valleys in the eastern part of the survey area. The vegetation is mainly bud sagebrush, Bailey greasewood, shadscale, and Indian ricegrass. This unit makes up about 2 percent of the survey area.

The Bundorf soils are shallow over a hardpan. They are medium textured in the surface layer and fine textured in the subsoil.

The Sutcliff soils are deep over a hardpan. They are medium textured in the surface layer. The subsoil is moderately fine textured and is very cobbly or stony.

The Rednik soils are very deep. They are moderately coarse textured in the surface layer, moderately fine textured in the subsoil, and coarse textured in the substratum. These soils are very gravelly throughout.

Of minor extent in this unit are Kleinbush, Washoe, and Bango soils. The Kleinbush soils are on tops of alluvial fan remnants and have a fine textured subsoil. The Washoe soils are near drainageways. The Bango soils are on terraces adjacent to small playas.

This unit is used mainly as rangeland and for rangeland wildlife habitat. The main limitation for these uses is the very low precipitation.

Areas dominated by partially moist soils on alluvial fans and terraces

Three map units are in this group. Most of the soils in this group are on alluvial fans and terraces in the central part of the survey area. Elevation is 4,400 to 6,000 feet. The average annual precipitation is 8 to 12 inches, the average annual temperature is 45 to 50 degrees F, and the frost-free period is about 90 to 110 days.

These soils are well drained to excessively drained and are shallow to very deep. Slopes are nearly level to steep.

6. Haybourne-Wedertz-Mottsville

Nearly level to strongly sloping, very deep, well drained and excessively drained soils; on alluvial fans and terraces

This map unit is mostly in the central valleys of the survey area. The vegetation is mainly big sagebrush, antelope bitterbrush, Anderson peachbrush, and Indian ricegrass. This unit makes up about 8 percent of the survey area.

The gently sloping to strongly sloping, well drained Haybourne soils are on alluvial fans. These soils are very deep. They have a coarse textured surface layer, a moderately coarse textured subsoil, and a coarse or moderately coarse textured substratum.

The gently sloping to moderately sloping, well drained Wedertz soils are on alluvial fans and terraces. These soils are very deep. They have a moderately coarse and coarse textured surface layer, a moderately fine textured subsoil, and weak silica cementation below the subsoil.

The nearly level to strongly sloping, excessively drained Mottsville soils are on alluvial fans. These soils are very deep and are coarse textured throughout.

Of minor extent in this unit are Linhart, Incy, Bedell, Aladshi, and Kayo soils. The Linhart soils are on inset alluvial fans, the Bedell soils are on alluvial fans, and the Incy soils are on sand dunes. The Aladshi and Kayo soils are on west-facing alluvial fans along the eastern edge of this map unit.

This unit is used mainly for urban development, rangeland, limited crop production, and wildlife habitat.

The main limitation for urban development is flash-flooding during storms of unusually high intensity. The main limitations to use as rangeland and for rangeland wildlife habitat are the low available water capacity of the soils and low precipitation. The main limitation to use as cropland is the lack of water for irrigation and the low available water capacity of the soils.

7. Reno-Galeppi-Chalco

Gently sloping to steep, shallow to very deep, well drained soils; on dissected alluvial fans, terraces, and pediments

This map unit is mostly in the higher parts of the central and western valleys and along the Truckee River drainage system. The vegetation is mostly low sagebrush, big sagebrush, and Thurber needlegrass. This unit makes up about 13 percent of the survey area.

The gently sloping to strongly sloping Reno soils are on terraces and pediments. These soils are moderately deep over a hardpan. They are moderately coarse textured in the surface layer and are fine textured in the subsoil over the hardpan.

The moderately sloping to moderately steep Galeppi soils are on dissected alluvial fans and terraces. These soils are very deep. The surface layer is moderately coarse textured, the subsoil is moderately fine textured, and the substratum has weak silica cementation.

The moderately sloping to strongly sloping Chalco soils are on the tops of pediments, and the moderately steep to steep Chalco soils are on pediment backslopes. These soils are shallow over soft bedrock. The surface layer is medium textured or moderately fine textured, and the subsoil is fine textured.

Of minor extent in this unit are Cassiro, Barnard, Aquinas, Greenbrae, Waspo, Stodick, Arzo, and Celeton Variant soils and Badland. The Cassiro and Barnard soils are on high-lying alluvial fans and terraces. The Aquinas and Greenbrae soils are on alluvial fans and terraces near granitic hills. The Waspo and Stodick soils are on pediments. The Arzo soils are on low-lying hills. The Celeton Variant soils and Badland are on eroding areas of pediments.

This unit is used mainly for urban development, rangeland, and wildlife habitat.

The main limitations for urban development are the high clay content and the restricted depth to bedrock or a hardpan. The main limitation to use as rangeland and for rangeland wildlife habitat is the low and moderately low precipitation.

8. Oest-Orr-Leviathan

Nearly level to steep, very deep, well drained soils; on alluvial fans and terraces

This map unit is mostly in the valleys of the western part of the survey area and along the terraces of the Truckee River. The vegetation is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. This unit makes up about 3 percent of the survey area.

The Oest soils are on nearly level to moderately sloping tops of terraces, steep side slopes of terraces, and moderately sloping to moderately steep alluvial fans. These soils have a moderately coarse textured and medium textured surface layer, a moderately fine textured subsoil, and a moderately coarse textured to coarse textured substratum. They are very gravelly throughout.

The Orr soils are on nearly level to moderately sloping alluvial fans and terraces. These soils have a moderately coarse textured surface layer and a moderately fine textured subsoil. The texture of the substratum is variable.

The Leviathan soils are on nearly level to moderately sloping tops of terraces and moderately steep and steep side slopes. These soils have a moderately coarse textured surface layer and a moderately fine textured subsoil. They are very gravelly or very cobbly throughout.

Of minor extent in this unit are Fleischmann, Holbrook, Springmeyer, and Bieber soils. The Fleischmann, Springmeyer, and Bieber soils are on terraces. The Fleischmann and Bieber soils have a hardpan. The Holbrook soils are near drainageways.

This unit is mainly used for urban development, crops, irrigated pasture, rangeland, and wildlife habitat.

These soils are relatively well suited to use for urban development. Many areas of these soils, however, are near live streams. Water supplies can be contaminated because the substratum or the material below the substratum is rapidly permeable. The Orr soils are suited to irrigated crops and openland wildlife habitat where water is available. The moderately low precipitation is a limitation to use as rangeland and for rangeland wildlife habitat.

Areas dominated by dry soils on foothills and low hills

One map unit is in this group. The soils in this group are on uplands in the foothills in the eastern part of the survey area. Elevation is 4,400 to 6,000 feet. The average annual precipitation is 4 to 8 inches, the average annual temperature is 48 to 52 degrees F, and the frost-free period is about 100 to 120 days.

These soils are well drained to somewhat excessively drained, very shallow to deep, and strongly sloping to steep.

9. Osobb-Singatse-Fireball

Strongly sloping to steep, very shallow to deep, well drained and somewhat excessively drained soils; on uplands

This map unit is mostly in the eastern part of the survey area. The vegetation is mainly bud sagebrush, Bailey greasewood, shadscale, and Indian ricegrass. This unit makes up about 8 percent of the survey area.

The strongly sloping to steep, well drained Osobb soils are on uplands in foothills. These soils are shallow and have a hardpan over bedrock. They are medium textured to moderately coarse textured and are very gravelly throughout.

The strongly sloping to moderately steep, somewhat excessively drained Singatse soils are on eroded slopes of uplands. These soils are very shallow over bedrock. They are moderately coarse textured or medium textured and are very gravelly throughout.

The steep, well drained Fireball soils are on colluvial upland slopes. These soils are deep over bedrock. They are moderately coarse textured in the surface layer and medium textured in the subsoil and are very gravelly or very cobbly throughout.

Of minor extent in this unit are the Rezave, Pirouette, Hefed, Bombadil, and Trocken soils and Rock outcrop. The Rezave and Pirouette soils are on basalt plateaus. The Hefed soils are on north-facing colluvial slopes. The Trocken soils are on alluvial fans in canyon bottoms. The Bombadil soils are on north- and east-facing slopes.

This unit is mainly used as rangeland and for rangeland wildlife habitat. The main limitation for these uses is very low precipitation.

Areas dominated by partially moist soils on foothills and low hills

Three map units are in this group. The soils in this group are on uplands in the central part of the survey area. Elevation is 4,400 to 6,500 feet. The average annual precipitation is 8 to 12 inches, the average annual temperature is 47 to 50 degrees F, and the frost-free period is about 80 to 110 days.

These soils are well drained to somewhat excessively drained, very shallow to moderately deep, and moderately sloping to very steep.

10. Acrelane-Graufels-Glenbrook

Moderately sloping to very steep, shallow and moderately deep, well drained and somewhat excessively drained soils; on granitic uplands

This map unit is mostly in the western and central foothills and low mountain ranges of the survey area. The vegetation is mainly big sagebrush, antelope bitterbrush, bottlebrush squirreltail, and some scattered juniper. This unit makes up about 10 percent of the survey area.

The strongly sloping to steep, well drained Acrelane soils are on foothills and low mountainous uplands. These soils are shallow over granitic bedrock. They are moderately coarse textured in the surface layer and

moderately fine textured in the subsoil above the bedrock. They are very gravelly throughout.

The moderately sloping to steep, somewhat excessively drained Graufels soils are on foothills and low mountainous uplands. These soils are moderately deep over granitic bedrock and are coarse textured throughout.

The moderately sloping to very steep, somewhat excessively drained Glenbrook soils are on foothills and low mountainous uplands. These soils are shallow over granitic bedrock and are coarse textured throughout.

Of minor extent in this unit are Haypress, Luppino, Surgem, Tanob, and Calpin soils and Rock outcrop. The Haypress and Tanob soils are on mountains at higher elevations. The Luppino soils are on pediments. The Surgem soils are on lower slopes. The Calpin soils are on small alluvial fans.

This unit is used mainly for urban development, rangeland, and rangeland wildlife habitat.

The main limitations for urban development are steepness of slope and the restricted depth of the soils over bedrock. The main limitation to use as rangeland and for rangeland wildlife habitat is the low and moderately low precipitation.

11. Indiano-Flex-Koontz

Strongly sloping to steep, very shallow to moderately deep, well drained soils; on uplands

This map unit is mostly in the western and central parts of the survey area on hills and low mountains. The vegetation is mainly big sagebrush, antelope bitterbrush, green ephedra, cheatgrass, and some scattered juniper. This unit makes up about 5 percent of the survey area.

The moderately steep to steep Indiano soils are on low mountainous uplands. These soils are moderately deep over altered volcanic rocks. They are moderately coarse textured and medium textured in the surface layer and moderately fine textured in the subsoil.

The strongly sloping to steep Flex soils are on low mountainous uplands. These soils are very shallow over weathered metavolcanic rock. They are moderately coarse textured in the surface layer and moderately fine textured in the subsoil and are very gravelly throughout.

The strongly sloping to steep Koontz soils are on mountainous uplands. These soils are shallow over weathered metavolcanic rock. They are medium textured in the surface layer and moderately fine textured in the subsoil.

Of minor extent in this unit are Wedekind, Mizel, and Yuko soils. The Wedekind and Yuko soils are on upland slopes similar to those of the major soils. The Yuko soils are very shallow. The Mizel soils are very shallow and are on eroded, rounded ridges and tops.

This unit is used mainly as rangeland and for rangeland wildlife habitat. The main limitations for these uses are the low and moderately low precipitation and the low available water capacity.

12. Xman-Duco-Old Camp

Moderately sloping to steep, shallow, well drained soils; on uplands

This map unit is mostly in the central foothills and low mountain ranges. The vegetation is mainly low sagebrush, big sagebrush, bottlebrush squirreltail, and scattered groves of juniper. This unit makes up about 23 percent of the survey area.

The moderately sloping to steep Xman soils are on foothills and low mountainous uplands. These soils have a moderately coarse textured and medium textured surface layer and a fine textured subsoil.

The moderately steep to steep Duco soils are on ridges. These soils have a moderately coarse textured surface layer and a moderately fine textured subsoil. They are very gravelly or very cobbly throughout.

The strongly sloping to steep Old Camp soils are on foothills and low mountainous uplands. These soils have a moderately coarse textured surface layer and a very cobbly moderately fine textured subsoil.

Of minor extent in this unit are McQuarrie, Tristan, Mizel, Arzo, Risley, Cagle, Frodo, and Smallcone soils and Rock outcrop. The McQuarrie and Tristan soils are in positions on uplands similar to those of the major soils. The Arzo soils are on lower slopes. The Mizel soils are on eroded slopes and rounded hills. The Frodo soils are on remnant plateaus. The Cagle soils are only in the Virginia Range and support pinyon pine. The Smallcone soils are on eroded slopes of acid rocks in the Virginia Range and support sparse stands of Jeffrey pine.

This unit is used mainly as rangeland and for rangeland wildlife habitat. The main limitations for these uses are the steepness of the slopes and the low and moderately low precipitation.

Areas dominated by soils on high mountains

Six map units are in this group. The soils in this group are on high mountainous uplands in the central part of the area and on the eastern slopes of the Sierras in the western side of the survey area. Elevation is 5,500 to 10,000 feet. The average annual precipitation is 14 to 50 inches, the average annual temperature is 40 to 45 degrees F, and the frost-free period is 30 to 90 days.

These soils are well drained to excessively drained, shallow to very deep, and moderately sloping to very steep.

13. Softscrabble-Gabica-Sumine

Strongly sloping to steep, shallow to very deep, well drained soils; on uplands

This map unit is mostly in the western, central, and northern parts of the survey area on mountainous uplands. The vegetation is mainly big sagebrush, low sagebrush, antelope bitterbrush, lupine, Idaho fescue,

and muleears. This unit makes up about 1 percent of the survey area.

The moderately steep to steep Softscrabble soils are on slightly concave mountainous uplands. These soils are very deep. They are medium textured in the surface layer and moderately fine textured and very gravelly or cobbly in the subsoil.

The strongly sloping to moderately steep Gabica soils are on ridges on mountainous uplands. These soils are shallow over hard bedrock. They are moderately coarse textured in the surface layer and moderately fine textured in the subsoil and are very gravelly or very cobbly throughout.

The steep Sumine soils are on mountainous uplands. These soils are moderately deep. They are medium textured in the surface layer and moderately fine textured in the subsoil and are very gravelly or very cobbly throughout.

Of minor extent in this unit are Mosquet, Thulepah, and Ticino soils and Rock outcrop. The Mosquet and Thulepah soils are at the highest elevations. The Ticino soils support mountainmahogany.

This unit is used mainly as rangeland and is suited to rangeland wildlife habitat. The main limitation for these uses is the cold spring temperatures. The shallow root zone and the very low available water capacity of the Gabica soil are also limitations.

14. Fraval-Booford-Jumbo

Strongly sloping to steep, moderately deep and deep, well drained soils; on mountainous uplands

This map unit is mostly on the lower slopes of the Sierra Nevada Mountains in the western part of the survey area. The vegetation is mainly Jeffrey pine, big sagebrush, antelope bitterbrush, and some mountainmahogany. This unit makes up about 3 percent of the survey area.

The steep Fraval soils are on mountainous uplands. These soils are moderately deep over tuff. They are medium textured in the surface layer and medium textured or moderately fine textured in the subsoil and are very gravelly.

The strongly sloping to steep Booford soils are on the lower slopes of mountains. These soils are moderately deep over weathered bedrock. They are medium textured in the surface layer and fine textured in the subsoil.

The steep Jumbo soils are on colluvial mountain slopes. These soils are deep over tuff. They are medium textured in the surface layer and medium or moderately fine textured in the subsoil and are very cobbly.

Of minor extent in this unit are Apmat, Duckhill, Duckhill Variant, Inville Variant, and Barshaad soils. The Apmat soils are on alluvial fans. The Inville Variant soils are on terrace and glacial outwash remnants. The Duckhill soils are on eroded side slopes, and the Duckhill Variant soils are on ridges. The Barshaad soils are on plateaus and ridgetops.

This unit is used mainly as woodland and rangeland and for wildlife habitat.

The main limitation to use as woodland and for woodland wildlife habitat is the marginal precipitation. The main limitations to use as rangeland are the steepness of slopes and the moderately low precipitation in the grazeable areas.

15. Tallac-Fugawee-Jorge

Moderately sloping to steep, moderately deep to very deep, well drained soils; on mountain slopes and moraines

This map unit is mostly in the Sierra Nevada Mountains in the western part of the survey area. The vegetation is mainly white fir, California red fir, and Jeffrey pine with an understory of manzanita, snowbrush ceanothus, and squawcarpet. This unit makes up about 3 percent of the survey area.

The moderately sloping to steep Tallac soils are on glacial moraines. These soils are deep. They are moderately coarse textured and are very stony or very bouldery throughout.

The moderately steep to steep Fugawee soils are on mountainous uplands. These soils are moderately deep over weathered bedrock. They are moderately coarse textured in the surface layer and moderately fine textured and medium textured in the subsoil.

The moderately steep to steep Jorge soils are on mountainous uplands. These soils are very deep. They are moderately coarse textured in the surface layer and medium textured in the subsoil and are very gravelly throughout.

Of minor extent in this unit are Hirschdale and Boomtown soils and Rock outcrop. The Hirschdale and Boomtown soils are on upland slopes and have a clayey subsoil.

This unit is used mainly as woodland and for woodland wildlife habitat. The main limitations for these uses are the moderate precipitation and the steep slopes.

16. Meiss-Sibella-Rock outcrop

Moderately steep to steep, shallow and deep, well drained to excessively drained cold soils and Rock outcrop; on uplands

This map unit is in the western part of the survey area on the highest mountain ridges and the high plateau of the Carson Range. The vegetation is mainly lodgepole pine, western white pine, whitebark pine, low sagebrush, lupine, willows, sedges, and quaking aspen. This unit makes up about 2 percent of the survey area.

The excessively drained Meiss soils are on ridges and crests of mountains. These soils are shallow over bedrock and are moderately coarse textured and medium textured throughout.

The well drained Sibelia soils are on mountainous upland slopes. These soils are deep and are moderately coarse textured and very gravelly throughout.

The Rock outcrop is on peaks and ridges. It is barren and is mostly volcanic rock.

Of minor extent in this unit are Sibelia Variant, Carioca, Macareeno, and Blackwell soils. The Sibelia Variant and Carioca soils are on high plateaus. The Marcareeno soils, in snow pocket areas, are poorly drained and support quaking aspen. The Blackwell soils are on flood plains and support meadow vegetation.

This unit is used mainly as woodland and for woodland wildlife habitat. The main limitation for these uses is the very short growing season.

17. Corbett-Toiyabe-Rock outcrop

Moderately steep to very steep, shallow and moderately deep, somewhat excessively drained and excessively drained soils and Rock outcrop; on mountainous granitic uplands

This map unit is mostly on the lower slopes of the Sierra Nevada Mountains in the western part of the survey area. The vegetation is mainly Jeffrey pine. This unit makes up about 2 percent of the survey area.

The moderately steep to steep, somewhat excessively drained Corbett soils are on mountainous uplands. These soils are moderately deep over granitic rock and are coarse textured throughout.

The moderately steep to very steep, excessively drained Toiyabe soils are on mountainous uplands. These soils are shallow over weathered granitic bedrock and are coarse textured throughout.

The Rock outcrop is on peaks and ridges. It is barren and consists of granitic rock.

Of minor extent in this unit are Haypress, Railcity, Marla, Gabica, and Blackwell soils. The Railcity soils are in material from landslides. The Blackwell soils are on flood plains. The Marla soils are on alluvial fans. The Gabica soils are on windswept ridges. The Haypress soils are on lower north-facing slopes.

This unit is used mainly as woodland and for woodland wildlife habitat. The main limitations for these uses are the lack of adequate precipitation for timber production and the low available water capacity of the soils.

18. Temo-Witefels-Rock outcrop

Moderately steep to very steep, shallow and moderately deep, somewhat excessively drained and excessively drained cold soils and Rock outcrop; on mountainous granitic uplands

The map unit is mostly on the higher slopes of the Sierra Nevada Mountains in the western part of the survey area. The vegetation is mainly white fir, California red fir, Jeffrey pine, western white pine, whitebark pine, and prostrate manzanita. This unit makes up about 1 percent of the survey area.

The steep, excessively drained Temo soils are on mountainous uplands. These soils are shallow over weathered granitic rocks and are coarse textured throughout.

The moderately steep to very steep, somewhat excessively drained Witefels soils are on mountainous uplands. These soils are moderately deep over weathered granitic rocks and are coarse textured throughout.

The Rock outcrop is on peaks and ridges. It is barren and consists of granitic rock.

Of minor extent in this unit are Graylock, Blackwell, and Gabica soils. The Graylock soils are on steep colluvial slopes. The Blackwell soils are on flood plains. The Gabica soils are on wind-swept ridges.

This unit is used mainly as woodland and for woodland wildlife habitat. The main limitations for these uses are the very short growing season and the very low available water capacity of the soil.

Broad Land Use Considerations

The soils in Washoe County, South Part, vary widely in their potential for major land uses such as urban development, woodland, cropland, pasture, rangeland, and wildlife habitat. Extensive changes in land use took place during the time when this survey was made, and more changes can be expected in the near future. The major changes were conversion of cropland, pasture, rangeland, and woodland to urban uses. Also, some rangeland was converted to irrigated cropland.

Approximately 18 percent of the land in the area is used for urban development at various intensities. Map units 1, 2, 6, 7, 8, 10, and parts of 12 are extensively used for urban development. Careful management of nearly all these soils is needed to overcome their limitations for urban development. The hazard of flooding is a limitation on the soils in map units 1 and 6. The seasonal high water table is a limitation in map units 1 and 2. In some of the soils in map units 2, 7, and 12, the high clay content in the subsoil is a limitation to use for urban development. Because of the steepness of slope and restricted depth to hardpan or bedrock in the soils in map units 7, 10, and 12, special design or use of special equipment is required.

Approximately 70 percent of the land in the survey area is used for rangeland and related uses. The productivity of the soils used for this purpose varies widely. In the map units in the eastern part of the survey area, mainly units 3, 4, 5, and 9, low precipitation is a limitation to rangeland grazing. Steepness of slope, which makes access for livestock difficult, is a limitation mainly on units 9, 10, 11, and 12.

About 10 percent of the land in the area is used as woodland. Map units 14, 15, 16, 17, and 18 are the main areas used. The commercial value of these woodlands varies for the different types of soils. The main

limitations are the limited precipitation at lower elevations, the short growing season at higher elevations, and soil properties such as low available water capacity, steepness of slope, and shallowness of the root zone over bedrock. In addition to their commercial value for timber production, these woodlands also have esthetic value that should be considered when making management decisions.

Less than 2 percent of the land in the survey area is used for cropland and pasture. About 20 percent of the area would be suitable for cropland if irrigation water were available and other uses did not have priority. The main crops are small grains and alfalfa and some potatoes. The areas used are mainly in map units 1, 2, 6, and 8. The seasonal high water table is a limitation in map unit 1; salt and alkali limit the use of map unit 2; and the lack of water for irrigation limits the use of map units 6 and 8.

Almost all of Washoe County, South Part, is inhabited by one or more kinds of wildlife. The Truckee River, Washoe Lake, Pyramid Lake, and the large irrigation ditches in the Truckee meadows support several kinds of fish.

The openland wildlife common to the area includes pheasant, valley quail, cottontail rabbit, meadowlark, and killdeer. Map unit 1 is used extensively by these species. This unit provides good habitat because water is available and the native meadows and pasture provide food and cover. The small areas of cropland and rangeland in these units provide additional food and cover and further enhance the overall habitat. The parts of map units 2, 6, 7, and 8 that are irrigated are also used by openland wildlife species. Watering places need to be provided when the areas are not being irrigated. Fence rows, ditchbanks, and odd corners can be planted to selected plants to improve the habitat. The adjacent range areas provide additional cover.

The wetland wildlife common to the survey area includes ducks, geese, herons, muskrat, and beaver. Map unit 1 is the only area that extensively supports wetland wildlife. The soils in map unit 1 support wetland plants. Shallow water areas can be established on the nearly level soils of this unit. Establishing shallow water areas on the more sloping soils is more difficult. In areas that have been drained, limitations to use of the soils for wetland wildlife habitat are severe.

The rangeland wildlife common to the area includes antelope, mule deer, jackrabbit, chukar, and sage grouse. Map units 6, 7, 8, 10, 11, 12, and 13 are used extensively by rangeland wildlife. In much of this area, the native plant community is limited by the low precipitation. Proper design and placement of watering facilities are beneficial.

The woodland wildlife common to the area includes wild turkey, blue grouse, woodpeckers, squirrels, raccoon, and a few black bear. Map units 14, 15, 16, 17, and 18 support woodland wildlife. Good watershed management practices will improve the habitat.

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, Truckee silt loam, strongly saline, is one of several phases in the Truckee 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. Settlemeyer-Notus complex 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. Barnard-Trosi association 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. Rock outcrop 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 4 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.

Soil Descriptions

101—Aquinas sandy loam, 4 to 8 percent slopes. This moderately deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is light brown sandy clay loam about 30 inches thick. The upper 9 inches of the substratum is a strongly silica-cemented hardpan. The lower part to a depth of 60 inches is compacted stratified valley fill. Depth to the hardpan ranges from 30 to 40 inches.

Included in this unit are Jowec Variant soils on the toe slopes of alluvial fans, Greenbrae soils on inset alluvial fans at lower parts of the unit, and Northmore soils on alluvial fan collars on the upper part of the unit. The unit is about 5 percent Jowec Variant soils, 5 percent Greenbrae soils, and 5 percent Northmore soils.

Permeability of this Aquinas soil is slow. Available water capacity is moderate. Effective rooting depth is 30 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the moderately high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and diverting water so that the soil near buildings is kept dry. The main limitations for septic tank absorption fields are the slowly permeable subsoil and the hardpan. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field. The suitability of the soil for septic tank absorption fields can be improved by ripping the hardpan.

The low load-bearing strength and susceptibility of the soil to frost heaving are moderate limitations to the use of this soil as sites for roads. If roads are built across areas of this soil, suitable material should be added to strengthen the base and drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, Douglas rabbitbrush, and bottlebrush squirreltail. The production of forage is limited by the restricted depth of the root zone over the hardpan, the low precipitation, and the moderate available water capacity. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIs, nonirrigated.

102—Aquinas sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is light brown sandy clay loam about 30 inches thick. The upper 9 inches of the substratum is a strongly silica-cemented hardpan. The lower part to a depth of 60 inches is compacted, stratified valley fill. The depth to the hardpan ranges from 30 to 40 inches.

Included in this unit are Jowec Variant soils on the toe slopes of alluvial fans, Greenbrae soils on inset alluvial fans on lower parts of the unit, and Northmore soils on alluvial fan collars. The unit is about 5 percent Jowec Variant soils, 5 percent Greenbrae soils, and 5 percent Northmore soils.

Permeability of this Aquinas soil is slow. Available water capacity is moderate. 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 slight.

This unit is used for urban development and as rangeland.

The steepness of slope and the high clay content of this soil are moderate limitations to use of the unit as sites for dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitations to use of this unit as septic tank absorption fields are the slowly permeable subsoil and the hardpan. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves the suitability of the soil for septic tank absorption fields.

Steepness of slopes, low load-bearing strength, and susceptibility to frost heaving are moderate limitations to use of the unit as sites for roads. Roads should be provided with a stable base and drainage and should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas of this soil is mainly big sagebrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by the restricted depth of the root zone over the hardpan, the low precipitation, and the moderate available water capacity. This soil is rated as poorly suited to rangeland seeding because of low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed to maintain adequate plant cover to protect the unit from excessive erosion.

This soil is in capability subclass VIs, nonirrigated.

106—Aquinas sandy loam, 8 to 15 percent slopes, eroded. This moderately deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is brown sandy loam about 1 inch thick. The subsoil is light brown sandy clay loam about 28 inches thick. The upper 7 inches of the substratum is a strongly silica-cemented hardpan. The lower part to a depth of 60 inches is compacted stratified valley fill. Depth to the hardpan ranges from 30 to 40 inches.

Included in this unit are Jowec Variant soils on the toe slopes of alluvial fans, eroded Badland on steeper side slopes, Holbrook soils near drainageways, and Aquinas soils that have slopes of 15 to 50 percent. The unit is about 4 percent Jowec Variant soils, 4 percent Badland, 4 percent Holbrook soils, and 3 percent steeper Aquinas soils.

Permeability of this Aquinas soil is slow. Available water capacity is moderate. 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 slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the steepness of slope and high clay content of this soil are moderate limitations to use as sites for dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitations to use of this unit as septic tank absorption fields are the slowly permeable subsoil and the hardpan. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field. Ripping the hardpan improves the suitability of the soil for septic tank absorption fields.

Steepness of slope, low load-bearing strength, and susceptibility to frost heaving are moderate limitations to use of this soil as sites for roads. Roads should be provided with drainage and should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, Douglas rabbitbrush, and bottlebrush squirreltail. The production of forage is limited by the restricted depth of the root zone over the hardpan, low precipitation, and moderate available water capacity. This soil is rated as poorly suited to rangeland seeding because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIs, nonirrigated.

110—Jowec Variant sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on convex alluvial fans and terraces. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 10 inches thick. The upper 10 inches of the subsoil is light brown clay. The lower 46 inches is light yellowish brown sandy clay loam, sandy loam, or clay loam.

Included in this unit are Aquinas soils on alluvial fan remnants on slightly higher surfaces, Greenbrae soils on inset alluvial fans near the lower edge of the unit, Northmore soils near the bottom of smooth and less sloping areas, and Badland. The unit is about 4 percent Aquinas soils, 4 percent Greenbrae soils, 4 percent Northmore soils, and 3 percent Badland.

Permeability of this Jowec 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the high clay content is a moderate limitation to use as sites for dwellings. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the very slow permeability in the upper part of the subsoil. The limitation can be overcome by increasing the size of the absorption field.

The susceptibility of the soil to frost heaving and high clay content are moderate limitations to use of this soil as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush and Indian ricegrass. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

111—Jowec Variant-Greenbrae sandy loams, 4 to 15 percent slopes. This map unit is on rolling terraces. Elevation is 4,500 to 5,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 65 percent Jowec Variant sandy loam, 8 to 15 percent slopes, and 25 percent Greenbrae sandy loam, 4 to 8 percent slopes. Areas of these soils are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Aquinas soils on alluvial fan remnants on slightly higher surfaces; Northmore soils on lower parts of smooth and less sloping surfaces; and Verdico Variant soils, which occur on uplands and have bedrock within 40 inches. This unit is about 3 percent Aquinas soils, 5 percent Northmore soils, and 2 percent Verdico Variant soils.

The Jowec Variant soil is very deep and well drained. It formed in alluvium derived dominantly from granitic rocks. Typically, the surface layer is grayish brown sandy

loam about 12 inches thick. The upper 10 inches of the subsoil is light brown clay. The lower part to 60 inches is light brown stratified sandy clay loam, clay loam, and clay.

Permeability of the Jowec 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 slight.

The Greenbrae soil is very deep and well drained. It formed in alluvium derived dominantly from granitic rocks. Slope is 4 to 8 percent. Typically, the surface layer is grayish brown sandy loam about 10 inches thick. The subsoil is brown sandy clay loam and clay loam about 18 inches thick. The substratum to a depth of 63 inches or more is pale brown stratified sand, gravelly loam, and loam.

Permeability of the Greenbrae 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 slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the high clay content of both soils and the steepness of slope of the Jowec Variant soil are moderate limitations for dwellings. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the restricted permeability. This limitation can be reduced by increasing the size of the absorption field. In some areas, percolation can also be improved by placing the leach line below the least permeable layer.

Steepness of slope, susceptibility to frost heaving, and high clay content are moderate limitations to use of this soil as sites for roads. Roads should be provided with drainage and an adequate wearing surface. They should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and Indian ricegrass. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

The soils in this unit are in capability subclass VIs, nonirrigated.

120—Doten silty clay, 0 to 2 percent slopes. This very deep, moderately well drained soil is on lake terraces. It formed in alluvium derived from mixed rock. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown silty clay about 7 inches thick. The underlying material to a depth of 60 inches is grayish brown and averages clay and silty clay. Typically, this soil cracks open at the surface when dry.

Included in this unit are Mellor soils on slightly higher terraces, Playas, Jowec soils on upper edges of terraces, and Parran soils near seeps and wet spots on lower landscape positions. This unit is about 3 percent Mellor soils, 3 percent Playas, 6 percent Jowec soils, and 3 percent Parran soils.

Permeability of this Doten soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is ponded or very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. This soil is subject to rare flooding during storms of unusually high intensity. The seasonal high water table is at a depth of 60 to 72 inches in spring. Channeling and deposition are common along streambanks. In some areas, this soil is ponded for long periods during spring.

This unit is used for urban development and as rangeland.

Flooding, high clay content, and low load-bearing strength are limitations to use of this soil as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The high shrink-swell potential, which results from the high clay content of this soil, can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is very slow permeability. The limitation can be overcome by increasing the size of the absorption field.

The main limitations to use of this soil as sites for roads are high clay content, flooding, and low load-bearing strength. Suitable material should be added to provide adequate wearing surface and a stable base. Roads should be provided with drainage.

The present vegetation in most areas is mainly black greasewood, shadscale, and bottlebrush squirreltail. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

This soil is in capability subclass VIIs, nonirrigated.

121—Doten silty clay, 8 to 15 percent slopes. This very deep, moderately well drained soil is on lake terraces and clay dunes. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown silty clay about 8 inches thick. The underlying material to a depth of 60 inches is grayish brown clay or silty clay.

Included in this unit are Doten Variant soils on lower lake terraces and Updike soils between clay dunes on lower lake terraces. The unit is about 8 percent Doten Variant soils and 7 percent Updike soils.

Permeability of this Doten 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 urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for dwellings are the high clay content, which results in high shrink-swell potential, and the low load-bearing strength. The high shrink-swell potential and low load-bearing strength can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is very slow permeability. This limitation can be overcome by increasing the size of the absorption field.

The main limitations to use of this soil as sites for roads are the high clay content and low load-bearing strength. If roads are constructed across areas of this soil, suitable material should be added to provide an adequate wearing surface and a stable base.

The present vegetation in most areas is mainly black greasewood, shadscale, and bottlebrush squirreltail. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

This soil is in capability subclass VIIs, nonirrigated.

130—Greenbrae sandy loam, clayey substratum, 0 to 2 percent slopes. This very deep, well drained soil is on terraces and lower parts of alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The subsoil is brown sandy clay loam and sandy clay about 17 inches thick. The upper 29 inches of the substratum is gravelly sandy loam. The lower part of the substratum to a depth of 60 inches is light gray silty clay loam.

Included in this unit are Orr Variant soils on lower alluvial fans, Haybourne soils on higher alluvial fan collars, and Northmore soils near the top of the unit. This unit is about 5 percent Orr Variant soils, 5 percent Haybourne soils, and 5 percent Northmore soils.

Permeability of this Greenbrae 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 slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

This soil is well suited to use as sites for dwellings. The main limitation to use of this unit as septic tank absorption fields is the slowly permeable subsoil. The limitation can be overcome by increasing the size of the absorption field. In some areas, percolation can also be improved by placing the leach line below the least permeable layer.

Susceptibility to frost heaving is a moderate limitation to use of this soil as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, rubber rabbitbrush, and bottlebrush squirreltail. The production of forage is limited by low precipitation. Because precipitation is low, this soil is rated as poorly suited to rangeland seeding. Clearing of brush would encourage the growth of desirable forage grasses. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIs, nonirrigated, and IIs, irrigated.

131—Greenbrae sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on terraces and lower parts of alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 10 inches thick. The subsoil is brown sandy clay loam or clay loam about 20 inches thick. The substratum to a depth of 63 inches or more is light yellowish brown gravelly fine sandy loam and loam.

Included in this map unit are Haybourne soils on the inset alluvial fans, Indian Creek soils on terrace

remnants, and Northmore soils along the top of the unit. The unit is about 5 percent Haybourne soils, 5 percent Indian Creek soils, and 5 percent Northmore soils.

Permeability of this Greenbrae 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 slight. This unit is used for urban development and rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the limitation to use as sites for dwellings is the high clay content, which causes moderately high shrink-swell potential. The shrink-swell potential can cause structural damage to buildings. Damage can be prevented if foundations and footings are properly designed, and the soil is kept dry by diverting water away from the buildings. The main limitation to use of the unit as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. Percolation can also be improved in some areas by placing the leach line below the least permeable layer.

Low strength, the susceptibility of the soil to frost heaving, and high clay content are moderate limitations to use of this unit as sites for roads. Suitable base material and an adequate wearing surface are needed. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, Douglas rabbitbrush, and Thurber needlegrass. The production of forage is limited by low precipitation. This soil is rated poor for rangeland seeding because of the low precipitation. Grazing should be delayed until the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush encourages the growth of desirable forage grasses. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIs, nonirrigated, and IIs, irrigated.

132—Greenbrae sandy loam, 2 to 4 percent slopes. This very deep, well drained soil is on terraces and lower parts of alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 8 inches thick. The subsoil is brown clay loam about 20 inches thick. The substratum to a depth of 63 inches or more is pale brown, stratified coarse sand, gravelly loam, and loam.

Included in this unit are Orr Variant soils on lower-lying alluvial fans, Indian Creek soils on remnants of higher terraces, and Northmore soils along the top of the unit. The unit is about 5 percent Orr Variant soils, 5 percent Indian Creek soils, and 5 percent Northmore soils.

Permeability of this Greenbrae 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 slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, a moderate limitation to use as sites for dwellings is high clay content, which results in moderately high shrink-swell potential. The moderately high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the slowly permeable subsoil. The limitation of slow permeability can be overcome by increasing the size of the absorption field. Percolation can be improved in some areas by placing the leach line below the least permeable layer.

Low load-bearing strength, susceptibility to frost heaving, and high clay content are moderate limitations to use of this soil as sites for roads. If roads are built across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, Douglas rabbitbrush, and Thurber needlegrass. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed to insure that enough vegetation is left to protect the unit from excessive erosion. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIs, nonirrigated, and IIs, irrigated.

134—Greenbrae sandy loam, clayey substratum, 4 to 8 percent slopes. This very deep, well drained soil is on terraces and lower parts of alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 6 inches thick. The subsoil is brown sandy clay loam about 18 inches thick. The upper 28 inches of the substratum is pale brown sandy loam. The lower part of the substratum to a depth of 68 inches is silty clay

loam. Depth to the clayey material ranges from 40 to 70 inches.

Included in this unit are Orr Variant soils on lower-lying alluvial fans, Haybourne soils on alluvial fan collars, and Northmore soils along the top of the unit. This unit is about 5 percent Orr Variant soils, 5 percent Haybourne soils, and 5 percent Northmore soils.

Permeability of this Greenbrae 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 slight.

This unit is used for urban development and as rangeland.

This soil is well suited to use as sites for dwellings. The main limitation to use of this soil as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving is a moderate limitation to use of this soil as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, rubber rabbitbrush, and Indian ricegrass. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIs, nonirrigated.

136—Greenbrae sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on terraces and lower parts of alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil is brown clay loam about 20 inches thick. The substratum to a depth of 63 inches or more is pale brown stratified coarse sand, gravelly loam, and loam.

Included in this unit are Orr Variant soils on less-sloping and lower lying alluvial fans, Indian Creek soils on remnants of slightly higher terraces, and Northmore soils along the top of the unit. This unit is about 5 percent Orr Variant soils, 5 percent Indian Creek soils, and 5 percent Northmore soils.

Permeability of this Greenbrae 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 slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, a moderate limitation to use of this soil as sites for dwellings is high clay content, which causes moderately high shrink-swell potential. The moderately high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the slowly permeable subsoil. The limitation can be overcome by increasing the size of the absorption field. In some areas, percolation can also be improved by placing the leach line below the least permeable layer.

Low load-bearing strength, susceptibility to frost heaving, and the high clay content are moderate limitations to use of this soil as sites for roads. If roads are constructed across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, rubber rabbitbrush, and Indian ricegrass. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIs, nonirrigated.

140—Haybourne loamy sand, 2 to 4 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,900 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown loamy sand about 10 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum to a depth of 63 inches or more is brown, stratified fine sandy loam through coarse sand.

Included in this unit are Greenbrae soils on toe slopes of alluvial fans; Indian Creek soils on remnants of higher terraces; and Incy soils, which are wind-blown sand and are on dunes. This unit is about 5 percent Greenbrae soils, 5 percent Indian Creek soils, and 5 percent Incy soils.

Permeability of this Haybourne soil is moderately rapid in the subsoil and moderately rapid to rapid in the substratum. Available water capacity of the soil 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 soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for construction of dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The rapidly permeable substratum is a limitation to use of this soil as septic tank absorption fields. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Susceptibility to frost heaving and flooding are moderate limitations to use of this soil as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, green ephedra, and Anderson peachbrush. The production of forage is limited by low precipitation and the moderate available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor because of the very low available water capacity of the surface layer. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIs, nonirrigated.

141—Haybourne loamy sand, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,900 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown loamy sand about 10 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum to a depth of 60 inches or more is brown, stratified fine sandy loam, loamy sand, and coarse sand.

Included in this unit are Incy soils, which are wind-blown sand and are on dunes; Indian Creek soils on remnants of higher terraces, and Linhart soils on inset alluvial fans near drainageways. This unit is about 5 percent Incy soils, 5 percent Indian Creek soils, and 5 percent Linhart soils.

Permeability of this Haybourne soil is moderately rapid in the subsoil and moderately rapid to rapid in the substratum. 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 soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for construction of dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The rapidly permeable substratum is a limitation to use of this soil as septic tank absorption fields. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Susceptibility to frost heaving and flooding are moderate limitations to use of this soil as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and Indian ricegrass. The production of forage is limited by low precipitation and moderate available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIs, nonirrigated.

142—Haybourne loamy sand, 8 to 15 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,900 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown loamy sand about 12 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum to a depth of 60 inches or more is brown, stratified fine sandy loam, loamy sand, and coarse sand.

Included in this map unit are Incy soils on dunes, Indian Creek soils on remnants of higher terraces, and Linhart soils on inset alluvial fans near drainageways. The unit is about 5 percent Incy soils, 5 percent Indian Creek soils, and 5 percent Linhart soils.

Permeability of this Haybourne soil is moderately rapid in the subsoil and moderately rapid to rapid in the substratum. Available water capacity of the soil 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 soil is subject to flash flooding during storms of unusually high

intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this soil as sites for dwellings. Structures for protection from flash floods are difficult to establish and maintain. The main limitation to the use of this soil as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Moderate limitations for roads are the steepness of slope, flooding, and susceptibility to frost heaving. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and Indian ricegrass. The production of forage is limited by low precipitation and the moderate available water capacity of the soil. This soil is rated as very poorly suited to rangeland seeding because of the low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIs, nonirrigated.

150—Doten Variant silty clay, slightly saline. This very deep, moderately well drained soil is on low terraces. It formed in lacustrine deposits derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is light gray silty clay about 5 inches thick. The underlying material to a depth of 72 inches is light gray silty clay and clay.

Included in this unit are Greenbrae soils along the upper part of the unit on alluvial fans, Updike soils on remnants of low terraces between drainageways, and Doten Variant, strongly saline, soils along the lower edge of the unit. The unit is about 5 percent Greenbrae soils, 5 percent Updike soils, and 5 percent Doten Variant, strongly saline, soils.

Permeability of this Doten Variant soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 60 to 72 inches in late winter and spring. This soil is slightly affected by sodium salts. When dry, the surface has cracks 1 to 2 inches wide and 2 to 3 feet deep.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for dwellings is the high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is very slow permeability. This limitation can be overcome by increasing the size of the absorption field.

Low load-bearing strength and high clay content are moderate limitations to use of this soil as sites for roads. If roads are built across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly black greasewood and saltgrass. The production of forage is limited by low precipitation and salinity and alkalinity. This soil is poorly suited to rangeland seeding, mainly because of low precipitation and salinity and alkalinity. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

This soil is in capability subclass VIIs, nonirrigated.

151—Doten Variant silty clay, strongly saline. This very deep, moderately well drained soil is on low terraces. It formed in lacustrine deposits derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is light gray silty clay about 5 inches thick. The underlying material to a depth of 72 inches is light gray silty clay and clay.

Included in this unit are Greenbrae soils on higher parts on toe slopes of alluvial fans, Updike soils on remnants of low terraces between drainageways, and Doten Variant, slightly saline, soils along the upper edge of the unit. The unit is about 5 percent Greenbrae soils, 5 percent Updike soils, and 5 percent Doten Variant, slightly saline, soils.

Permeability of this Doten Variant soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 60 to 72 inches in late winter and spring. This soil is strongly affected by sodium salts.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which results in high shrink-swell

potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is very slow permeability. This limitation can be overcome by increasing the size of the absorption field.

Low load-bearing strength and high clay content are moderate limitations to use of this soil as sites for roads. If roads are built across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly black greasewood and saltgrass. The production of forage is limited by low precipitation and salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of salinity and alkalinity. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

This soil is in capability subclass VIIs, nonirrigated.

160—Incy sand, 4 to 8 percent slopes. This very deep, excessively drained soil is on low-lying dunes superimposed over alluvial fans. It formed in eolian sand derived from mixed, but dominantly granitic, rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sand about 9 inches thick. The underlying material to a depth of 60 inches is pale brown sand.

Included in this unit are Greenbrae soils on the toe slopes of lower alluvial fans, Wedertz soils on lower alluvial fans and terraces, and Haybourne soils on higher alluvial fans near drainageways. The unit is about 5 percent Greenbrae soils, 5 percent Wedertz soils, and 5 percent Haybourne soils.

Permeability of this Incy soil is very 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 unit is used for urban development and range.

This unit is well suited to use as sites for dwellings. The main limitation for septic tank absorption fields is the very rapidly permeable substratum. Because the substratum is very rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. Roads can easily be constructed and maintained on this soil.

The present vegetation in most areas of this soil is mainly big sagebrush, Anderson peachbrush, and antelope bitterbrush. The production of forage is limited by the low available water capacity. This soil is rated as very poorly suited to rangeland seeding because the available water capacity of the surface layer is low. Grazing should be delayed until the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from erosion.

This soil is in capability subclass VIIs, nonirrigated.

161—Incy fine sand, hilly. This very deep, excessively drained soil is on sand dunes. It formed in eolian sand derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown fine sand about 12 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand.

Included in this unit are Dalzell soils between sand dunes, Haybourne soils on higher alluvial fans near drainageways, Wedertz soils on lower alluvial fans and terraces, and Playas. The unit is about 4 percent Dalzell soils, 5 percent Haybourne soils, 4 percent Wedertz soils, and 2 percent Playas.

Permeability of this Incy soil is very 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 unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for dwellings is the steepness of slope. The main limitations to use of this soil as septic tank absorption fields are the very rapid permeability and the steepness of slope. Because the underlying material is very rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies and to prevent surfacing of the leachate downslope.

The main limitation to use of this soil as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and antelope bitterbrush. The production of forage is limited by the low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the low available water capacity of the surface layer. Grazing should be delayed until the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

171—Indian Creek gravelly sandy loam, 0 to 4 percent slopes. This shallow, well drained soil is on

dissected fans and terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 25 to 35 percent of the surface is covered with gravel. The surface layer is pale brown gravelly sandy loam about 7 inches thick. The subsoil is light brown gravelly clay about 11 inches thick. The upper 7 inches of the substratum is a reddish yellow indurated hardpan. The lower part to a depth of 60 inches is reddish yellow, stratified very gravelly loamy coarse sand through gravelly sandy clay loam. Depth to the hardpan ranges from 14 to 20 inches.

Included in this unit are Cassiro soils on higher, smooth alluvial fans; Northmore soils on smooth, long slopes of alluvial fans on lower landscape positions; and Washoe soils near drainageways. This unit is about 5 percent Cassiro soils, 5 percent Northmore soils, and 5 percent Washoe soils.

Permeability of this Indian Creek soil is very slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is the hardpan. Heavy equipment is needed to cut through the hardpan. The main limitations to use of this unit as septic tank absorption fields are the very slowly permeable subsoil and the hardpan.

The hardpan is the main limitation to use of this soil as sites for roads. Deep cuts should be avoided because of the underlying hardpan.

The present vegetation in most areas is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the restricted depth of the root zone over the hardpan and the very low available water capacity. This soil is rated as poorly suited to rangeland seeding, mainly because of the very low available water capacity and the restricted depth of the root zone over the hardpan. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

172—Indian Creek sandy loam, 4 to 8 percent slopes. This shallow, well drained soil is on dissected alluvial fans and terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 10 to 20 percent of the surface is covered with gravel. The surface layer is pale brown sandy loam about 8 inches thick. The subsoil is light brown gravelly clay about 10 inches thick. The upper 7 inches of the substratum is a white indurated hardpan. The lower part to a depth of 60 inches is reddish yellow, stratified very gravelly loamy coarse sand through gravelly sandy clay loam. Depth to the hardpan ranges from 14 to 20 inches.

Included in this unit are Cassiro soils on higher, smooth alluvial fans; Northmore soils on smooth, long slopes of alluvial fans in lower landscape positions; and Washoe soils near drainageways. This unit is about 5 percent Cassiro soils, 5 percent Northmore soils, and 5 percent Washoe soils.

Permeability of this Indian Creek soil is very slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation for construction of dwellings is the hardpan. Heavy equipment is needed to cut through the hardpan. The main limitations to use of this soil as septic tank absorption fields are the very slowly permeable subsoil and the hardpan. In some areas, the percolation can be improved by placing the leach line below the hardpan.

The main limitation to use of this soil as sites for roads is the hardpan. Deep cuts should be avoided because of the hardpan.

The present vegetation in most areas is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the shallowness of the root zone over the hardpan and the very low available water capacity. This soil is rated as very poorly suited to rangeland seeding, mainly because of the very low available water capacity and the shallowness of the root zone. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

173—Indian Creek sandy loam, 8 to 15 percent slopes. This shallow, well drained soil is on dissected alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 10 to 20 percent of the surface is covered with gravel. The surface layer is pale brown sandy loam about 8 inches thick. The subsoil is light brown gravelly clay about 10 inches thick. The upper 7 inches of the substratum is a white indurated hardpan. The lower part to a depth of 60 inches is reddish yellow, stratified very

gravelly loamy coarse sand to gravelly sandy clay loam. Depth to the hardpan ranges from 14 to 20 inches.

Included in this unit are Cassiro soils along the upper edge of the unit on smooth alluvial fans; Northmore soils on smooth, long slopes of lower alluvial fans; and Washoe soils near drainageways. This unit is about 5 percent Cassiro soils, 5 percent Northmore soils, and 5 percent Washoe soils.

Permeability of this Indian Creek soil is very slow. Available water capacity is very low. Effective rooting depth is 14 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 urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is the hardpan. Heavy equipment is needed to cut through the hardpan. The main limitations to use of this soil as septic tank absorption fields are the very slowly permeable subsoil and the hardpan. In some areas, percolation can be improved by placing the leach line below the hardpan.

The main limitation to use of this soil as sites for roads is the hardpan. Deep cuts should be avoided because of the hardpan.

The present vegetation in most areas is mainly low sagebrush and cheatgrass. The production of forage is limited by the shallowness of the root zone over the hardpan and the very low available water capacity. Because the root zone is shallow and the available water capacity is very low, this soil is rated as very poorly suited to rangeland seeding. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

174—Indian Creek extremely stony sandy loam, 2 to 8 percent slopes. This shallow, well drained soil is on terrace remnants. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 15 to 30 percent of the surface is covered with stones. The surface layer is pale brown extremely stony sandy loam about 7 inches thick. The subsoil is light brown gravelly clay about 12 inches thick. The upper 4 inches of the substratum is a white indurated hardpan. The lower part to a depth of 60 inches is a light gray strongly cemented hardpan. Depth to the hardpan ranges from 14 to 20 inches.

Included in this unit are Leviathan soils on higher, smooth alluvial fans; Verdico soils on upland pediments near scarps; and Washoe soils near drainageways. This unit is about 5 percent Leviathan soils, 5 percent Verdico soils, and 5 percent Washoe soils.

Permeability of this Indian Creek soil is very slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the main limitations to use as sites for construction of dwellings are the hardpan and the high clay content, which results in a high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. Heavy equipment is needed to cut through the hardpan. The very slowly permeable subsoil and the hardpan are limitations to use of this soil as septic tank absorption fields.

The main limitations to use of this soil as sites for roads are the hardpan, high clay content, and low load-bearing strength. If roads are built across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface. Deep cuts should be avoided because of the underlying hardpan.

The present vegetation in most areas is mainly low sagebrush and cheatgrass. A small amount of juniper is dispersed throughout. The production of forage is limited by the restricted depth of the root zone over the hardpan and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the restricted depth of the root zone over the hardpan. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

175—Indian Creek very cobbly loam, 4 to 8 percent slopes. This shallow, well drained soil is on terraces and dissected alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 40 to 60 percent of the surface is covered with cobbles. The surface layer is pale brown very cobbly loam about 7 inches thick. The subsoil is light brown gravelly clay about 12 inches thick. The upper 4 inches of the substratum is a white indurated duripan. The lower part of the substratum to a depth of 60 inches is reddish yellow, stratified very gravelly loamy coarse sand through gravelly sandy clay loam. Depth to the hardpan ranges from 14 to 20 inches.

Included in this unit are Barnard soils at higher elevations on smooth or slightly concave surfaces, Spasprey soils on lower alluvial fan skirts, and Washoe

soils near drainageways. This unit is about 5 percent Barnard soils, 5 percent Spasprey soils, and 5 percent Washoe soils.

Permeability of this Indian Creek soil is very slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the main limitation to use as sites for construction of dwellings is the hardpan. Heavy equipment is needed to cut through the hardpan. The main limitations to use of this soil as septic tank absorption fields are the very slowly permeable subsoil and the hardpan. In some areas, percolation can be improved by placing the leach line below the hardpan.

The hardpan is the main limitation to use of this soil as sites for roads. Deep cuts should be avoided because of the hardpan.

The present vegetation in most areas is mainly low sagebrush and cheatgrass. A small amount of juniper is dispersed throughout. The production of forage is limited by the shallowness of the root zone over the hardpan and the very low available water capacity. Because the available water capacity is very low and the root zone is shallow, the suitability of this soil for rangeland seeding is very poor. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

176—Indian Creek-Reno-Washoe association. This map unit is on dissected alluvial fans and terraces. Elevation is 4,400 to 5,500 feet. The average annual precipitation is 8 to 10 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 50 percent Indian Creek stony loam, 2 to 15 percent slopes; 20 percent Reno very stony sandy loam, 2 to 15 percent slopes; and 15 percent Washoe extremely stony fine sandy loam, 4 to 15 percent slopes. The Indian Creek soil is on the tops of dissected alluvial fans. The Reno soil is on stream terraces. The Washoe soil is on inset fans and adjacent to drainageways.

Included in this unit are Barnard soils at higher elevations on smooth or slightly concave surfaces, Bundorf soils at lower elevations on remnants of terraces, Manogue soils on shallow depressions, and Rezave soils on small upland remnants. This unit is about 4 percent Barnard soils, 4 percent Bundorf soils, 4 percent Manogue soils, and 3 percent Rezave soils.

The Indian Creek soil is shallow and well drained. It formed in alluvium derived from mixed rock sources. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is pale brown stony loam about 7 inches thick. The subsoil is light brown gravelly clay about 12 inches thick. The upper 4 inches of the substratum is an indurated hardpan. The lower part of the substratum to a depth of 60 inches is stratified very gravelly or very cobbly loamy coarse sand through gravelly sandy clay loam. Depth to the hardpan ranges from 14 to 20 inches.

Permeability of this Indian Creek soil is very slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Reno soil is moderately deep and well drained. It formed in alluvium derived dominantly from mixed rock sources. Typically, 5 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony sandy loam about 2 inches thick. The subsoil is pale brown and light yellowish brown clay about 22 inches thick. The substratum is a strongly silica-cemented hardpan about 23 inches thick over weakly consolidated sediment. Depth to the hardpan ranges from 20 to 40 inches.

Permeability of this Reno soil is very slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is slow to moderate, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Washoe soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, about 15 percent of the surface is covered with stones. The surface layer is grayish brown extremely stony fine sandy loam about 8 inches thick. The subsoil is light brown very gravelly sandy loam and very gravelly sandy clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown very gravelly loamy coarse sand.

Permeability of this Washoe soil 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 slight. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Indian Creek soil is mainly low sagebrush and cheatgrass. The production of forage is limited by very low available water capacity and the shallowness of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the shallow root zone.

The present vegetation in most areas of the Reno soil is mainly low sagebrush, antelope bitterbrush, and cheatgrass. A small amount of juniper is dispersed throughout. The production of forage is limited by moderately low precipitation, very low available water capacity, and the restricted depth of the root zone over the hardpan. The suitability of this soil for rangeland seeding is poor, mainly because of the moderately low

precipitation, the very low available water capacity, and the restricted depth of the root zone.

The present vegetation in most areas of the Washoe soil is mainly big sagebrush. The production of forage is limited by low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the large stones on the surface.

Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The use of this unit as sites for roads is severely limited by the hardpan of the Indian Creek soil and the low load-bearing strength and high clay content of the Reno soil, and it is moderately limited by the high clay content, steepness of slope, and susceptibility to frost heaving of the Washoe soil. Roads should be provided with drainage. Suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the hardpan in the Indian Creek soils.

The soils in this unit are in capability subclass VIIs, nonirrigated.

190—Manogue cobbly clay, 2 to 8 percent slopes. This deep and very deep, well drained soil is on uplands. It formed in localized alluvium and colluvium derived dominantly from volcanic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 10 to 25 percent of the surface is covered with cobbles and pebbles. The surface layer is dark brown cobbly clay about 2 inches thick. The subsoil is brown clay about 61 inches thick. Weathered bedrock is at a depth of 63 inches. The depth to weathered bedrock ranges from 40 to 70 inches.

Included in this unit are Xman soils on higher, steeper, convex upland surfaces; Reno soils on terrace remnants; and Verdico Variant soils near outcrops of granitic rock. The unit is about 5 percent Xman soils, 5 percent Reno soils, and 5 percent Verdico Variant soils.

Permeability of this Manogue soil is very slow. Available water capacity is high. Effective rooting depth is 40 inches or more. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which results in high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the very slowly permeable subsoil. This limitation can be reduced by increasing the size of the absorption field.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and high clay content. If roads are built across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly bottlebrush squirreltail. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

191—Manogue cobbly clay, 8 to 15 percent slopes. This deep and very deep, well drained soil is on uplands. It formed in localized alluvium and colluvium derived dominantly from volcanic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 10 to 25 percent of the surface is covered with cobbles and pebbles. The surface layer is dark brown cobbly clay about 3 inches thick. The subsoil is brown clay about 60 inches thick. Weathered bedrock is at a depth of 63 inches. The depth to weathered bedrock ranges from 40 to 70 inches.

Included in this unit are Old Camp soils along ridges near Rock outcrop, Reno soils on terrace remnants on lower parts, and Xman soils at higher elevations on convex slopes. The unit is about 5 percent Old Camp soils, 5 percent Reno soils, and 5 percent Xman soils.

Permeability of this Manogue soil is very slow. Available water capacity is high. Effective rooting depth is 40 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 urban development and as rangeland.

If this soil is used for urban development, the main limitation to use as sites for dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the very slowly permeable subsoil. This limitation can be reduced by increasing the size of the absorption field.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and high clay content. If roads are built across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly bottlebrush squirreltail. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

192—Manogue cobbly clay, 15 to 30 percent slopes. This deep and very deep, well drained soil is on uplands. It formed in alluvium and colluvium derived dominantly from volcanic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 10 to 25 percent of the surface is covered with cobbles and pebbles. The surface layer is dark brown cobbly clay about 4 inches thick. The subsoil is brown clay about 59 inches thick. Weathered bedrock is at a depth of 63 inches. The depth to weathered bedrock ranges from 40 to 70 inches.

Included in this unit are Old Camp soils along ridges near Rock outcrop, Xman soils at higher elevations on convex slopes, and Verdico Variant soils on smooth, slightly convex slopes. The unit is about 5 percent Old Camp soils, 5 percent Xman soils, and 5 percent Verdico Variant soils.

Permeability of this Manogue soil is very slow. Available water capacity is high. Effective rooting depth is 40 inches or more. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the main limitations to use as sites for dwellings are the high clay content, which causes high shrink-swell potential, and the steepness of slope. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitations to use of this soil as sites for septic tank absorption fields are the very slowly permeable subsoil and the steepness of slope. The limitation imposed by very slow permeability can be reduced by increasing the size of the absorption field. The absorption field should be designed to prevent surfacing of the leachate downslope.

The main limitations to use of this soil as sites for roads are low load-bearing strength, steepness of slope, and high clay content. If roads are built across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly low sagebrush and cheatgrass. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

200—Northmore sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 15 inches thick. The subsoil is brown sandy clay about 30 inches thick. The substratum to a depth of 60 inches or more is pale brown sandy loam.

Included in this unit are Greenbrae soils on inset alluvial fans, Indian Creek soils on terrace remnants, Cassiro soils near drainageways and at higher elevations, and wet areas that support lush plant growth. The unit is about 6 percent Greenbrae soils, 4 percent Indian Creek soils, 3 percent Cassiro soils, and 2 percent wet areas.

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

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. In some areas, percolation can also be improved by placing the leach line below the least permeable layer.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and high clay content. If roads are built across areas of this soil,

suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed to insure that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass IIs, irrigated, and VIs, nonirrigated.

201—Northmore sandy loam, 2 to 4 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 15 inches thick. The subsoil is brown sandy clay about 30 inches thick. The substratum to a depth of 60 inches or more is pale brown sandy loam.

Included in this unit are Greenbrae soils on inset alluvial fans at lower elevations, Indian Creek soils on terrace remnants, Cassiro soils near drainageways and at higher elevations, and wet areas that occur as seeps. The unit is about 6 percent Greenbrae soils, 4 percent Indian Creek soils, 3 percent Cassiro soils, and 2 percent wet areas.

Permeability of this Northmore 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. In some areas, percolation can also be improved by placing the leach line below the least permeable layer.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and high clay content. If roads are built across areas of this soil,

suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, Douglas rabbitbrush, and littleleaf horsebrush. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclasses IIe, irrigated, and VIs, nonirrigated.

202—Northmore sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 10 inches thick. The subsoil is brown sandy clay about 35 inches thick. The substratum to a depth of 60 inches or more is pale brown sandy loam.

Included in this unit are Greenbrae soils on inset alluvial fans at lower elevations, Indian Creek soils on terrace remnants, Cassiro soils near drainageways and at higher elevations, and wet areas that occur as seeps. The unit is about 6 percent Greenbrae soils, 4 percent Indian Creek soils, 3 percent Cassiro soils, and 2 percent wet areas.

Permeability of this Northmore 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. In some areas, percolation can also be improved by placing the leach line below the least permeable layer.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and high clay content. If roads are built across areas of this soil,

suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas of this soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough soil is left to protect the unit from excessive erosion.

This soil is in capability subclasses IVe, irrigated, and VIs, nonirrigated.

203—Northmore sandy loam, 8 to 15 percent slopes. This very deep, well drained soil is on side slopes of alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 10 inches thick. The subsoil is brown sandy clay about 35 inches thick. The substratum to a depth of 60 inches or more is pale brown sandy loam.

Included in this unit are Indian Creek soils on terrace remnants, Cassiro soils near drainageways at higher elevations, and Oest soils on steep side slopes and along the top of the unit. The unit is about 5 percent Indian Creek soils, 5 percent Cassiro soils, and 5 percent Oest soils.

Permeability of this Northmore 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content. The high clay content can cause high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. Percolation can also be improved in some areas by placing the leach line below the least permeable layer.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by the low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIs, nonirrigated.

210—Luppino gravelly sandy loam, 4 to 8 percent slopes. This shallow, well drained soil is on dissected pediments. It formed in residuum derived dominantly from granodiorite. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with fine gravel. The surface layer is brown gravelly sandy loam about 8 inches thick. The subsoil is yellowish brown sandy clay loam about 6 inches thick. Weathered granodiorite is at a depth of 14 inches. Unweathered granodiorite is at a depth of 23 inches. Depth to weathered bedrock ranges from 12 to 20 inches. Depth to hard bedrock ranges from 20 to 30 inches.

Included in this unit are Greenbrae soils on inset alluvial fans in the lower parts of wider dissections, Graufels soils near Rock outcrop, Linhart soils near drainageways, and Rock outcrop. The unit is about 6 percent Greenbrae soils, 4 percent Graufels soils, 3 percent Linhart soils, and 2 percent Rock outcrop.

Permeability of this Luppino soil is moderately slow. Available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

Depth to bedrock and high clay content are moderate limitations to use of this soil as sites for dwellings. Heavy equipment is needed to cut into the bedrock. The high clay content can cause moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the shallowness of this soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The susceptibility of this soil to frost heaving and depth to bedrock are moderate limitations to use of this soil as sites for roads. Deep cuts should be avoided because of the underlying bedrock. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush and Thurber needlegrass. A small amount of juniper is dispersed throughout. The production of forage is limited by the shallowness of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the shallowness of the root zone. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

211—Luppino gravelly sandy loam, 8 to 15 percent slopes. This shallow, well drained soil is on dissected pediments. It formed in residuum derived dominantly from granodiorite. Elevation is 4,500 to 5,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with fine gravel. The surface layer is brown gravelly sandy loam about 8 inches thick. The subsoil is yellowish brown sandy clay loam about 6 inches thick. Weathered granodiorite is at a depth of 14 inches. Unweathered granodiorite is at a depth of 23 inches. Depth to weathered bedrock ranges from 12 to 20 inches. Depth to hard bedrock ranges from 20 to 30 inches.

Included in this unit are Graufels soils near Rock outcrop at higher elevations, Bedell soils on short alluvial fans and colluvial slopes, Linhart soils near drainageways, and Rock outcrop. The unit is about 6 percent Graufels soils, 4 percent Bedell soils, 3 percent Linhart soils, and 2 percent Rock outcrop.

Permeability of this Luppino soil is moderately slow. Available water capacity is very low. Effective rooting depth is 12 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 urban development and as rangeland.

The shallowness of this soil over bedrock, the high clay content, and the steepness of slope are moderate limitations to use of this unit as sites for construction of dwellings. Heavy equipment is needed to cut into the bedrock. The high clay content can result in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation for septic tank absorption fields is depth to bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations; however, if the density of housing is too high, community sewage systems are needed.

The susceptibility of this soil to frost heaving, shallowness over bedrock, and steepness of slope are moderate limitations to use of this unit as sites for roads. Deep cuts should be avoided because of the underlying bedrock. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and green ephedra. A small amount of juniper is dispersed throughout. The production of forage is limited by the shallowness of the shallowness of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the shallowness of the root zone. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

221—Oppio cobbly sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum derived dominantly from andesite and other volcanic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 20 to 35 percent of the surface is covered with cobbles. The surface layer is pale brown cobbly sandy loam about 3 inches thick. The subsoil is brown clay about 18 inches thick. Hard, fractured bedrock is at a depth of 21 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are Yuko soils on rounded ridges and south-facing slopes; Old Camp soils near Rock outcrop; Barshaad soils on less sloping, slightly concave slopes; and Rock outcrop. The unit is about 5 percent Yuko soils, 4 percent Old Camp soils, 3 percent Barshaad soils, and 3 percent Rock outcrop.

Permeability of this Oppio soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the high clay content. The high clay content can cause high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is restricted depth to bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush and Douglas rabbitbrush. The production of forage is limited by the restricted depth of the root zone over bedrock and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIs, nonirrigated.

222—Oppio cobbly sandy loam, 15 to 30 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum derived dominantly from andesite and other volcanic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with cobbles. The surface layer is pale brown cobbly sandy loam about 5 inches thick. The subsoil is brown clay about 16 inches thick. Hard, fractured bedrock is at a depth of 21 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are Yuko soils on rounded ridges, rounded tops, and south-facing slopes; Old Camp soils near Rock outcrop; Xman soils on slightly convex slopes; and Rock outcrop. The unit is about 5 percent Yuko soils, 4 percent Old Camp soils, 3 percent Xman soils, and 3 percent Rock outcrop.

Permeability of this Oppio soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitations to use of this unit as sites for construction of dwellings are the steepness of slope and high clay content. The high clay content can result in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitations to use of this unit as septic tank absorption fields are the restricted depth to bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength, steepness of slope, and high clay content. Suitable material should be added to strengthen the base and provide an adequate wearing surface. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly low sagebrush and Douglas rabbitbrush. The production of forgage is limited by the restricted depth of the root zone over bedrock and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIs, nonirrigated.

223—Oppio-Rezave-Rock outcrop association. This map unit is on uplands. Elevation is 5,400 to 6,500 feet. The average annual precipitation is 7 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 40 percent Oppio cobbly sandy loam, 4 to 15 percent slopes; 35 percent Rezave extremely stony very fine sandy loam, 0 to 15 percent slopes; and 10 percent Rock outcrop. The Oppio soil is on slightly concave parts of plateaus. The Rezave soil is on the convex part of plateaus and rounded hilltops. Rock outcrop is on peaks and ridges.

Included in this map unit are Mizel soils on steep, eroded, upper side slopes; Fireball soils on colluvial south-facing slopes; and Hefed soils on colluvial north- and east-facing slopes. The unit is about 6 percent Mizel soils, 5 percent Fireball soils, and 4 percent Hefed soils.

The Oppio soil is moderately deep and well drained. It formed in residuum dominantly of andesite and other volcanic rock. Typically, 20 to 35 percent of the surface is covered with cobbles. The surface layer is light brownish gray cobbly sandy loam about 4 inches thick. The subsoil is brown clay about 17 inches thick. Hard, fractured bedrock is at a depth of 21 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of this Oppio soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Rezave soil is shallow and well drained. It formed in residuum dominantly of basalt. Typically, 15 to 50 percent of the surface is covered with stones. The surface layer is light brownish gray extremely stony very fine sandy loam about 4 inches thick. The subsoil is light yellowish brown stony clay about 9 inches thick. The substratum to a depth of 19 inches or more is yellow, weakly silica-cemented gravelly clay loam. Hard basalt bedrock is at a depth of 19 inches. Depth to bedrock ranges from 14 to 20 inches.

Permeability of the Rezave soil is slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop is exposed volcanic rock. It occurs as small peaks and ridges.

This unit is used as rangeland.

The present vegetation in most areas of the Oppio soil is mainly low sagebrush and Douglas rabbitbrush. The production of forage is limited by low precipitation, very low available water capacity, and restricted depth of the root zone over bedrock. The soil is rated as very poorly suited to rangeland seeding because of the very low available water capacity.

The present vegetation in most areas of the Rezave soil is mainly Bailey greasewood, spiny hopsage, and Indian ricegrass. The production of forage is limited by very low precipitation, restricted depth of the root zone over bedrock, and very low available water capacity. The soil is rated as very poorly suited to rangeland seeding because of the very low precipitation, the restricted depth of the root zone over bedrock, and the very low available water capacity of the surface layer.

Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

The main limitations to use of this unit as sites for roads are the low strength, high clay content, and depth to bedrock. Suitable base material and an adequate wearing surface are needed. Deep cuts should be avoided because of the underlying bedrock.

The Oppio soil is in capability subclass VIs, nonirrigated. The Rezave soil is in capability subclass VIIs, nonirrigated.

230—Cradlebaugh loam. This very deep, poorly drained soil is on low terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 4,800 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 49 degrees F, and the average frost-free period is 100 to 105 days.

Typically, the surface layer is grayish brown loam about 10 inches thick. The upper 25 inches of the underlying material is light yellowish brown, light gray, and white, stratified silty clay loam through fine sandy loam. The lower part to a depth of 60 inches is pale brown sandy loam. Depth to weak silica cementation ranges from 18 to 24 inches.

Included in this unit are Lemm soils on alluvial fans at relatively higher elevations; Fettic soils, which occur as alluvial fan remnants; and Dressler soils on toe slopes of alluvial fans and near drainageways. The unit is about 5 percent Lemm soils, 5 percent Fettic soils, and 5 percent Dressler soils.

Permeability of this Cradlebaugh soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 12 to 24 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 12 to 24 inches in late winter or spring. This soil is occasionally flooded for brief to long periods in spring. This soil is slightly to moderately affected by sodium salts.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Seasonal flooding and the high water table are limitations to use as sites for dwellings. Seasonal flooding can be controlled only by major flood control structures. Lowering the water table through drainage improves suitability for use as sites for dwellings. The main limitations to use of this unit as septic tank absorption fields are flooding, the high water table, and moderately slow permeability. Dikes and channels that have outlets to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Care is needed to avoid polluting the water supplies. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field.

The main limitations to use of this unit as sites for roads are the low load-bearing strength, flooding, and susceptibility of this soil to frost heaving. Drainage should be provided. Suitable material should be added to strengthen the base.

The present vegetation in most areas is mainly black greasewood, basin wildrye, and saltgrass. The production of forage is limited by salinity and alkalinity. The suitability of this soil for rangeland seeding is poor, mainly because of salinity and alkalinity. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Salt blocks should be placed in less accessible areas rather than near water and in easily accessible areas to insure uniform grazing.

This soil is in capability subclasses IVw, irrigated, and VIw, nonirrigated.

240—Updike loam. This very deep, moderately well drained soil is on low-lying, slightly concave lake terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is light gray loam about 2 inches thick. The subsoil is brown, pale brown, and light gray clay and sandy clay about 18 inches thick. The substratum to a depth of 63 inches or more is pale brown, stratified sandy clay loam, clay loam, and clay.

Included in this unit are Cradlebaugh soils, which occur as stringers in low-lying narrow channels; Sagouspe soils, on water-worked sand beaches; and Doten soils, near Playas and on clay dunes. The unit is about 8 percent Cradlebaugh soils, 5 percent Sagouspe soils, and 2 percent Doten soils.

Permeability of this Updike soil is very slow. Available water capacity is high. Effective rooting depth is 72 inches for water-tolerant plants but is limited to 60 to 72 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 60 to 72 inches in late winter and spring. This soil is affected by sodium salts.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the high clay content. The high clay content can cause high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the very slowly permeable subsoil. This limitation can be reduced by increasing the size of the absorption field. Percolation can also be improved in some areas by placing the leach line below the least permeable layer.

Low load-bearing strength and high clay content are the main limitations to use of this unit as sites for roads. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas is mainly black greasewood, shadscale, and cheatgrass. The production of forage is limited by salinity and alkalinity. The suitability of this soil for rangeland seeding is poor, mainly because of salinity and alkalinity. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas to insure uniform grazing.

This soil is in capability subclass VIIs, nonirrigated.

241—Updike loam, gravelly substratum. This very deep, moderately well drained soil is on low-lying, slightly concave lake terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is light gray loam about 2 inches thick. The subsoil and upper part of the substratum are mainly pale brown clay about 34 inches thick. The next 11 inches of the substratum is pale brown sandy clay loam. The lower part to a depth of 63 inches is stratified gravelly sandy loam and very gravelly sand.

Included in this unit are Cradlebaugh soils that occur as stringers in low-lying, narrow channels; Sagouspe soils on water-worked sand beaches; and Doten soils near playas and on clay dunes. The unit is about 8 percent Cradlebaugh soils, 5 percent Sagouspe soils, and 2 percent Doten soils.

Permeability of this Updike soil is very slow in the subsoil and upper part of the substratum and very rapid in the lower part of the substratum. Available water capacity is high. Effective rooting depth is greater than 60 inches for water-tolerant plants but is limited to 48 to 72 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. The seasonal high water table is at a depth of 48 to 72 inches in spring and summer. This soil is subject to flooding during prolonged storms of high intensity. This soil is affected by sodium salts.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

Flooding and the high clay content, which results in a high shrink-swell potential, are limitations to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented if foundations are properly designed and the

soil near buildings is kept dry by diverting water away from it.

The main limitations for septic tank absorption fields are the very slowly permeable subsoil and upper part of the substratum and the very rapidly permeable lower part of the substratum. The limitation imposed by very slow permeability can be reduced by increasing the size of the absorption field. Absorption fields should be designed so that the leach lines are not placed into the very rapidly permeable layers. The leachate can move through the very rapidly permeable material and into the ground water or into nearby surface water before it is sufficiently purified.

The main limitations to use of this unit as sites for roads are low load-bearing strength and high clay content. If roads are built across areas of this soil, suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas of this soil is mainly grass. Under a good management system, this soil will produce yields of 6 animal-unit-months per acre of pasture. Shallow-rooted, water-tolerant plants are suited to this soil. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for pasture. The high water table limits the leaching of salts from the surface layer. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations and to improve forage production. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alkali in the surface layer.

This soil is in subclasses IVs, irrigated, and VIIs, nonirrigated.

250—Cassiro gravelly sandy loam, 2 to 4 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is brown gravelly sandy loam about 15 inches thick. The subsoil is brown very gravelly sandy clay about 30 inches thick. The substratum to a depth of 60 inches or more is stratified dense interbedded tuff, silt, ash, and valley fill.

Included in this unit are Indian Creek soils on terrace remnants, Oest soils near uplands on alluvial fan collars, Northmore soils on low, smooth alluvial fans, and wet areas that occur as seeps. The unit is about 5 percent Indian Creek soils, 4 percent Oest soils, 4 percent Northmore soils, and 2 percent wet areas.

Permeability of this Cassiro soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches and is limited by the dense substratum. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

The high clay content is a moderate limitation to use of this unit as sites for dwellings. The high clay content can cause moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water so that the soil near buildings is kept dry. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

A moderate limitation to use of this unit as sites for roads is the high clay content. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. The production of forage is limited by the moderately low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because of the moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil in in capability subclasses IIe, irrigated, and VIc, nonirrigated.

251—Cassiro gravelly sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is brown gravelly sandy loam about 12 inches thick. The subsoil is brown very gravelly sandy clay about 28 inches thick. The substratum to a depth of 60 inches or more is stratified dense interbedded tuff, silt, ash, and valley fill.

Included in this unit are Indian Creek soils on terrace remnants, Oest soils near uplands on alluvial fan collars, Northmore soils at higher elevations, and wet areas that occur as seeps. The unit is about 6 percent Indian Creek soils, 5 percent Oest soils, 2 percent Northmore soils, and 2 percent wet areas.

Permeability of this Cassiro soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches and is limited by the dense substratum. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, a moderate limitation to use as sites for dwellings is the high clay content. The high clay content can cause moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

The high clay content is a moderate limitation to use of this soil as sites for roads. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. The production of forage is limited by the moderately low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because of the moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVe, irrigated, and VIc, nonirrigated.

252—Cassiro gravelly sandy loam, 8 to 15 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is brown gravelly sandy loam about 13 inches thick. The subsoil is brown very gravelly sandy clay about 27 inches thick. The substratum to a depth of 60 inches or more is stratified dense interbedded tuff, silt, ash, and valley fill.

Included in this unit are Indian Creek soils on terrace remnants, Oest soils near uplands on higher alluvial fan skirts, Northmore soils at higher elevations, and wet areas that occur as seeps. The unit is about 6 percent Indian Creek soils, 5 percent Oest soils, 2 percent Northmore soils, and 2 percent wet areas.

Permeability of this Cassiro soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches and is limited by the dense substratum. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, moderate limitations for construction of dwellings are the steepness of slope and high clay content. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Steepness of slope and high clay content are moderate limitations to use of this unit as sites for roads. Suitable material should be added to provide an adequate wearing surface. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebursh, littleleaf horsebrush, and Indian ricegrass. The production of forage is limited by the moderately low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because of the moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush should encourage the growth of desirable forage grasses.

This soil is in capability subclass VIc, nonirrigated.

260—Acrelane-Rock outcrop complex, 15 to 50 percent slopes. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 65 percent Acrelane very stony sandy loam, 15 to 50 percent slopes, and 25 percent Rock outcrop. The Acrelane soil is on rolling uplands, and the Rock outcrop is on ridgetops and crests. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Verdico Variant soils on slightly concave slopes and in shallow depressions, Graufels soils at higher elevations near Rock outcrop, and Surgem soils on lower colluvial slopes. The unit is about 3 percent Verdico Variant soils, 4 percent Graufels soils, and 3 percent Surgem soils.

The Acrelane soil is shallow and well drained. It formed in residuum derived dominantly from granodiorite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 6 inches thick. The subsoil is brown very gravelly sandy clay loam about 4 inches thick. Weathered granodiorite is at a depth of 10 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

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

Rock outcrop consists of exposed areas of granodioritic rock.

This unit is used for urban development and as rangeland. It has the potential to be used as juniper woodland.

If this unit is used for urban development, steepness of slope is the main limitation to use as sites for dwellings. The main limitations to use of this unit as septic tank absorption fields are the shallowness of the soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

Steepness of slope is the main limitation to use of this unit as sites for roads. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. Scattered throughout the areas is a small amount of juniper. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the distribution of rock outcrops, and the shallowness of the root zone. Steepness of slope limits access to grazing land by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

Where the unit is used as woodland, a mature stand of trees (80 to 100 years) will yield about 4 to 8 cords of wood per acre.

The soil in this unit is in capability subclass VIIs, nonirrigated.

262—Acrelane very stony sandy loam, 8 to 15 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from granodiorite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 4 inches thick. The subsoil is brown very gravelly sandy clay loam about 6 inches thick. Weathered granodiorite is at a depth of 10 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

Included in this unit are Verdico Variant soils on slightly concave slopes and in shallow depressions, Surgem soils on lower colluvial slopes, Graufels soils at higher elevations near Rock outcrop, and Rock outcrop. The unit is about 4 percent Verdico Variant soils, 4 percent Surgem soils, 4 percent Graufels soils, and 3 percent Rock outcrop.

Permeability of this Acrelane 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 slight. This unit is used for urban development and as rangeland. It has the potential to be used as juniper woodland.

If this unit is used for urban development, moderate limitations to construction of dwellings are the steepness of slope, depth to bedrock, and stones. Heavy equipment is needed to cut into the bedrock and to excavate the large stones. The main limitation to use of this unit as septic tank absorption fields is the shallowness of the soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize this limitation. If the density of housing is too high, however, community sewage systems are needed.

Depth to bedrock, steepness of slope, and susceptibility of the soil to frost heaving are moderate limitations to use of this unit as sites for roads. Drainage should be provided. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The present vegetation in most areas is mainly big sagebrush and bottlebrush squirreltail. Scattered throughout the areas is a small amount of juniper. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor because the available water capacity is very low and the root zone is shallow. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

Where the soil is used as woodland, a mature stand of trees (80 to 100 years) will yield about 4 to 8 cords of wood per acre.

This soil is in capability subclass VIIs, nonirrigated.

280—Wedekind gravelly loam, 8 to 15 percent slopes. This shallow, well drained soil is on uplands. It formed in colluvium and residuum derived dominantly from andesite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is brown gravelly loam about 2 inches thick. The subsoil is brown sandy clay loam about 12 inches thick. Highly weathered andesite is at a depth of 14 inches. Depth to highly weathered bedrock ranges from 10 to 20 inches.

Included in this unit are Mizel soils on rounded ridges and hilltops, Flex soils on convex south-facing slopes, Holbrook soils on small alluvial fans at the mouth of canyons, and Rock outcrop. The unit is about 4 percent Mizel soils, 4 percent Flex soils, 4 percent Holbrook soils, and 3 percent Rock outcrop.

Permeability of this Wedekind soil is moderately 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 slight.

This unit is used for urban development and as rangeland.

The shallowness of this soil over bedrock, the steepness of slope, and the high clay content are moderate limitations to use of this unit as sites for dwellings. Heavy equipment is needed to cut into the bedrock. The high clay content can cause moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation for septic tank absorption fields is depth to bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations; if the density of housing is too high, however, community sewage systems are needed.

Moderate limitations to use of this unit as sites for roads are shallowness over bedrock, steepness of slope, and the susceptibility of this soil to frost heaving. Roads should be provided with drainage. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and muleears. The production of forage is limited by the shallowness of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because the depth of the root zone is restricted over bedrock and the available water capacity is very low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

281—Wedekind gravelly loam, 15 to 30 percent slopes. This shallow, well drained soil is on uplands. It formed in colluvium and residuum derived dominantly from andesite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is brown gravelly loam about 2 inches thick. The subsoil is brown sandy clay loam about 12 inches thick. Highly weathered andesite is at a depth of 14 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

Included in this unit are Mizel soils on rounded ridges and hilltops, Flex soils on convex south-facing slopes, and Tristan soils on concave north-facing slopes. The unit is about 5 percent Mizel soils, 5 percent Flex soils, and 5 percent Tristan soils.

Permeability of this Wedekind soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the shallowness of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, Douglas rabbitbrush, and bottlebrush squirreltail. The production of forage is limited by the shallowness of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor because slope is steep, the available water capacity is very low, and the depth to the root zone is restricted. Steepness of slope

limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIe, nonirrigated.

282—Wedekind gravelly sandy loam, 30 to 50 percent slopes. This shallow, well drained soil is on uplands. It formed in colluvium and residuum derived dominantly from andesite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is brown gravelly sandy loam about 4 inches thick. The subsoil is brown sandy clay loam about 10 inches thick. Highly weathered andesite is at a depth of 14 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

Included in this unit are Mizel soils on rounded ridges and on hilltops, Flex soils on slightly convex south-facing slopes, Tristan soils on concave north-facing slopes at higher elevations, and Rock outcrop. The unit is about 5 percent Mizel soils, 4 percent Flex soils, 4 percent Tristan soils, and 2 percent Rock outcrop.

Permeability of this Wedekind soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the shallowness of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this soil as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, Douglas rabbitbrush, and bottlebrush squirreltail. The production of forage is limited by the shallowness of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor because slope is steep, the available water capacity is very low, and the root zone is shallow. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIe, nonirrigated.

290—Verdico Variant stony sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum and colluvium derived dominantly from granodiorite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony sandy loam about 5 inches thick. The subsoil is brown gravelly clay about 23 inches thick. Highly weathered and fractured granodiorite is at a depth of 28 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Included in this unit are Acrelane soils along ridges and on convex slopes, Surgem soils on lower colluvial slopes, and Rock outcrop that occurs as isolated peaks. The unit is about 6 percent Acrelane soils, 6 percent Surgem soils, and 3 percent Rock outcrop.

Permeability of this Verdico Variant soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the high clay content. The high clay content can cause high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this unit as septic tank absorption fields are restricted depth to bedrock and the slowly permeable soil. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush and Douglas rabbitbrush. The production of forage is limited by the moderately low precipitation, low available water capacity, high clay content, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is poor, mainly because of the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

291—Verdico Variant very stony sandy loam, 15 to 30 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum and colluvium derived dominantly from granodiorite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature us 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 6 inches thick. The subsoil is brown gravelly clay about 22 inches thick. Highly weathered and fractured granodiorite is at a depth of 28 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Included in this unit are Acrelane soils along ridges and on convex slopes, Surgem soils on lower colluvial slopes, and Rock outcrop. The unit is about 6 percent Acrelane soils, 6 percent Surgem soils, and 3 percent Rock outcrop.

Permeability of this Verdico Variant soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

Steepness of slope and the high clay content are the main limitations to use of this unit as sites for dwellings. The high clay content can cause high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water so that the soil near buildings is kept dry.

The main limitations to use of this unit as septic tank absorption fields are the restricted depth to bedrock, the slowly permeable subsoil, and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field.

The main limitations to use of this unit as sites for roads are the low load-bearing strength, high clay content, and steepness of slope. Suitable material should be added to strengthen the base and provide an adequate wearing surface. If possible, roads should be located in less sloping areas to minimize cutting filling and to reduce erosion.

The present vegetation in most areas is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation, the shallowness of the root zone over bedrock, high clay content, and low available water capacity. The suitability of this soil for rangeland seeding is poor, mainly because of the abrupt textural boundary and steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

300—Surgem stony sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum and colluvium derived dominantly from granodiorite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony sandy loam about 4 inches thick. The subsoil is brown very cobbly clay about 20 inches thick. Unweathered bedrock is at a depth of 24 inches. Depth to hard, fractured, unweathered bedrock ranges from 20 to 30 inches.

Included in this unit are Acrelane soils on ridges and convex slopes, Verdico Variant soils on concave slopes and in shallow depressions, and Rock outcrop that occurs as small peaks. The unit is about 6 percent Acrelane soils, 6 percent Verdico Variant soils, and 3 percent Rock ouctrop.

Permeability of this Surgem soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

Stoniness is the main limitation to use of this unit as sites for dwellings. Heavy equipment is needed to excavate the large stones. The main limitations to use of this unit as septic tank absorption fields are restricted depth to bedrock and the large stones in the subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these

limitations. If the density of housing is too high, however, community sewage systems are needed. The large stones in the soil make preparing sites for absorption fields more difficult and also decrease the suitability of the soil for use as a filter.

The main limitation to use of this unit as sites for roads is stoniness. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush, Douglas rabbitbrush, and cheatgrass. The production of forage is limited by the moderately low precipitation, very low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because the available water capacity is very low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

301—Surgem-Rock outcrop complex, 15 to 30 percent slopes. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 75 percent Surgem stony sandy loam, 15 to 30 percent slopes, and 10 percent Rock outcrop. The Surgem soil is on side slopes of uplands, and the Rock outcrop is on ridges and peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Acrelane soils on ridges and convex slopes, Verdico Variant soils on concave slopes and in shallow depressions, and Graufels soils near Rock outcrop. The unit is about 6 percent Acrelane soils, 6 percent Verdico Variant soils, and 3 percent Graufels soils.

The Surgem soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from granodiorite. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony sandy loam about 5 inches thick. The subsoil is brown very cobbly clay about 19 inches thick. Hard, fractured, unweathered bedrock is at a depth of 24 inches. Depth to unweathered bedrock ranges from 20 to 30 inches.

Permeability of the Surgem soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop consists of exposed granodiorite as small peaks or ridges.

This unit is used for urban development and as rangeland.

Steepness of slope and stones are the main limitations to use of the unit as sites for dwellings. Heavy equipment is needed to excavate the large stones. The main limitations to use of this unit as septic tank absorption fields are the restricted depth to bedrock in this Surgem soil, large stones in the subsoil, and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed. Large stones in the soil make preparing sites for absorption fields more difficult and also decrease the suitability of the soil for use as a filter.

The main limitations for construction of roads are steepness of slope and stones. An adequate wearing surface is needed. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly low sagebrush, Douglas rabbitbrush, and cheatgrass. The production of forage is limited by the moderately low precipitation, very low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of the soil for rangeland seeding is very poor, mainly because of the very low available water capacity and steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

The soil in this unit is in capability subclass VIIs, nonirrigated.

302—Surgem-Rock outcrop complex, 30 to 50 percent slopes. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 65 percent Surgem stony sandy loam, 30 to 50 percent slopes, and 20 percent Rock outcrop. The Surgem soil is on side slopes of uplands, and Rock outcrop is on ridges and peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Acrelane soils near peaks and convex slopes, Verdico Variant soils on concave slopes and in shallow depressions, and Graufels soils near Rock outcrop. The unit is about 6 percent Acrelane soils,

6 percent Verdico Variant soils, and 3 percent Graufels soils.

The Surgem soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from granodiorite. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony sandy loam about 6 inches thick. The subsoil is brown very cobbly clay about 18 inches thick. Hard, fractured, unweathered bedrock is at a depth of 24 inches. Depth to unweathered bedrock ranges from 20 to 30 inches.

Permeability of the Surgem soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop consists of exposed granodiorite as small peaks or ridges.

This unit is used for urban development and as rangeland.

If the Surgem soil is used for urban development, the main limitations to use as sites for dwellings are the steepness of slope and stones. Heavy equipment is needed to excavate the large stones. The main limitations for septic tank absorption fields are the restricted depth over bedrock, the steepness of slope, and large stones in the subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed. Large stones in the soil make preparing sites for absorption fields more difficult and also decrease the suitability of the soil for use as a filter.

The main limitations to use of this unit as sites for roads are steepness of slope and stones. Suitable material should be added to provide an adequate wearing surface. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly low sagebrush, Douglas rabbitbrush, and cheatgrass. The production of forage is limited by the moderately low precipitation, very low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor. The low available water capacity and steepness of slope are the main limitations. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

310—Risley-Rock outcrop complex, 8 to 15 percent slopes. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 75 percent Risley very stony loam, 8 to 15 percent slopes, and 15 percent Rock outcrop. The Risley soil is on side slopes of uplands, and the Rock outcrop is on ridges and peaks. The components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Old Camp soils near Rock outcrop, Mizel soils on rounded ridges and hilltops, Indiano soils on concave slopes at higher elevations, and Xman soils on slightly convex south- and west-facing slopes. This unit is about 3 percent Old Camp soils, 3 percent Mizel soils, 3 percent Indiano soils, and 1 percent Xman soils.

The Risley soil is moderately deep and well drained. It formed in residuum dominantly of altered, weathered andesite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is light gray very stony loam about 4 inches thick. The subsoil is brown clay about 20 inches thick. Weathered, altered andesite is at a depth of 24 inches. Depth to weathered, altered andesite ranges from 20 to 30 inches.

Permeability of the Risley soil is slow. Available water capacity is low. Effective rooting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop consists of exposed andesite on small peaks and on ridges.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for dwellings is the high clay content of the soil, which results in high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The restricted depth of the soil over bedrock and the slowly permeable subsoil are the main limitations to use of this soil as septic tank absorption fields. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and high clay content. If roads are built across areas of this unit, suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas of this soil is mainly big sagebrush and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the restricted depth of the root zone over bedrock, the low available water capacity, and moderately low precipitation. The suitability of this soil for rangeland seeding is poor. The main limitation for seeding is the distribution of Rock outcrop. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

311—Risley-Rock outcrop complex, 15 to 30 percent slopes. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 65 percent Risley very stony loam, 15 to 30 percent slopes, and 25 percent Rock outcrop. The Risley soil is on side slopes of uplands, and Rock outcrop is on ridges and peaks. The components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Old Camp soils near Rock outcrop, Mizel soils on rounded ridges and hilltops, Indiano soils on concave slopes at higher elevations, and Xman soils on slightly convex south- and west-facing slopes. This unit is about 3 percent Old Camp soils, 3 percent Mizel soils, 2 percent Indiano soils, and 2 percent Xman soils.

The Risley soil is moderately deep and well drained. It formed in residuum dominantly of altered, weathered andesite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is light gray very stony loam about 3 inches thick. The subsoil is brown clay about 20 inches thick. Weathered, altered andesite is at a depth of 23 inches. Depth to weathered, altered andesite ranges from 20 to 30 inches.

Permeability of the Risley soil is slow. Available water capacity is low. Effective rooting depth is 20 to 30 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

Rock outcrop consists of exposed andesite on small peaks and on ridges.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for dwellings are the steepness of slope and high clay content of the soil, which results in high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this unit as septic tank absorption fields are depth to bedrock, slowly permeable subsoil, and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Designs that increase the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are low load-bearing strength, steepness of slope, and high clay content. If roads are built across areas of this unit, suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the restricted depth of the root zone over bedrock, the low available water capacity, and moderately low precipitation. The suitability of this soil for rangeland seeding is poor. The main limitations for seeding are the distribution of Rock outcrop and steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed to avoid overgrazing and ensure that enough vegetation is left to protect the unit from excessive erosion. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

312—Risley cobbly loam, 15 to 30 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum derived dominantly from altered, weathered andesite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 35 percent of the surface is covered with cobbles. The surface layer is light gray cobbly loam about 3 inches thick. The subsoil is brown clay about 20 inches thick. Weathered, altered andesite is at a depth of 23 inches. Depth to weathered, altered andesite ranges from 20 to 30 inches.

Included in this unit are Old Camp soils which occur near Rock outcrop, Mizel soils which occur on rounded ridges and hilltops, Rock outcrops that occur as isolated peaks, and Indiano soils on concave slopes at higher elevations. This unit is about 4 percent Old Camp soils, 4 percent Mizel soils, 4 percent Rock outcrop, and 3 percent Indiano soils.

Permeability of the Risley soil is slow. Available water capacity is low. Effective rooting depth is 20 to 30 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for dwellings are the steepness of slope and the high clay content of the soil, which results in high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this unit as septic tank absorption fields are depth to bedrock, the slowly permeable subsoil, and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Designs that increase the volume of soil used for filtering can minimize the limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this soil as sites for roads are low load-bearing strength, steepness of slope, and high clay content. If roads are built across areas of this unit, suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the restricted depth of the root zone over bedrock, the low available water capacity, and moderately low precipitation. The suitability of this soil for rangeland seeding is poor because of steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed to avoid overgrazing and insure that enough vegetation is left to protect the unit from excessive erosion erosion. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

313—Risley cobbly clay loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum derived dominantly from altered, weathered andesite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 35 percent of the surface is covered with cobbles. The surface layer is light gray cobbly clay loam about 4 inches thick. The subsoil is brown clay about 36 inches thick. Weathered, altered andesite is a depth of 40 inches. Depth to weathered, altered andesite ranges from 20 to 40 inches.

Included in this unit are Old Camp soils near Rock outcrop, Mizel soils on rounded ridges and hilltops, Rock outcrop that occurs as isolated peaks, and Indiano soils on concave slopes at higher elevations. This unit is about 4 percent Old Camp soils, 4 percent Mizel soils, 4 percent Rock outcrop, and 3 percent Indiano soils.

Permeability of the Risley soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for dwellings is the high clay content of the soil, which results in high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this unit as septic tank absorption fields are restricted depth over bedrock and the slowly permeable subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent could surface downslope or seep through cracks of the rock into the ground water. Designs that would increase the volume of soil used for filtering could minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content of the soil. If roads are built across areas of this unit, suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the restricted depth of the root zone over bedrock, the moderate available water capacity, and moderately low precipitation. The suitability of this soil for rangeland seeding is fair because of moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed to insure that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

314—Risley-Xman-Rock outcrop association. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 8 to 12 inches, the

average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 40 percent Risley cobbly loam, 15 to 30 percent slopes; 30 percent Xman very stony loam, 4 to 30 percent slopes; and 15 percent Rock outcrop. The Risley soil is on north-facing, colluvial slopes. Xman soil is near ridges and mountain tops, and Rock outcrop is on peaks and ridges.

Included in this unit are Old Camp soils near Rock outcrop, Mizel soils on rounded ridges and hilltops, Arzo soils on lower colluvial slopes, and Indiano soils on concave slopes at higher elevations. The unit is about 4 percent Old Camp soils, 4 percent Mizel soils, 4 percent Arzo soils, and 3 percent Indiano soils.

The Risley soil is moderately deep and well drained. It formed in residuum dominantly of altered, weathered andesite. The surface layer is brown cobbly loam about 6 inches thick. The subsoil is yellowish brown clay about 22 inches thick. Weathered, altered andesite is at a depth of 28 inches. Depth to weathered, altered andesite ranges from 20 to 30 inches.

Permeability of the Risley soil is slow. Available water capacity is low. Effective rooting depth is 20 to 30 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

The Xman soil is shallow and well drained. It formed in residuum dominantly of volcanic rocks. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 3 inches thick. The subsoil is brown clay about 11 inches thick. Weathered, altered andesite is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

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

Rock outcrop consists of barren andesitic rocks on ridges and peaks.

This unit is used as rangeland.

The present vegetation in most areas of this Risley soil is mainly big sagebrush, Douglas rabbitbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by moderately low precipitation, low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of the soil for rangeland seeding is fair. The main limitations for seeding are low available water capacity and the restricted depth of the root zone over bedrock.

The present vegetation in most areas of this Xman soil is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by low precipitation, very low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the restricted depth of the root zone over bedrock.

Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit is from excessive erosion.

The main limitations to use of this unit as sites for roads are low load-bearing strength, high shrink-swell potential, and steepness of slope. Suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

341—Yuko stony loam, 15 to 30 percent slopes. This very shallow, well drained soil is on uplands. It formed in residuum derived dominantly from volcanic rock. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 0.1 to 3 percent of the surface is covered with stones. The surface layer is brown stony loam about 2 inches thick. The subsoil is yellowish brown silty clay loam about 6 inches thick. Highly weathered andesite is at a depth of 8 inches. Depth to weathered bedrock ranges from 6 to 14 inches.

Included in this unit are Oppio soils on slightly concave slopes and in shallow depressions, Koontz soils on east- and north-facing slopes, and Rock outcrop that occurs as ridges and peaks. The unit is about 6 percent Oppio soils, 6 percent Koontz soils, and 3 percent Rock outcrop.

Permeability of this Yuko soil is moderately slow. Available water capacity is very low. Effective rooting depth is 6 to 14 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the steepness of slope.

The main limitation to use of this unit as septic tank absorption fields are the restricted depth to bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads is the steepness of slope. If possible, roads should

be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and green ephedra. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the shallowness of the root zone over bedrock. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

342—Yuko-Reywat-Rock outcrop association. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 10 to 12 inches, the average air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 35 percent Yuko very stony loam, 15 to 50 percent slopes; 25 percent Reywat extremely stony loam, 15 to 50 percent slopes; and 25 percent Rock outcrop. The Yuko soil is on south- and west-facing slopes near ridges and hilltops. The Reywat soil is on north- and east-facing slopes. Rock outcrop is on peaks and ridges.

Included in this unit are Oppio soils on slightly concave slopes and in shallow depressions, Old Camp soils near Rock outcrop, Hefed soils on lower colluvial slopes, and Duco soils on convex ridges at higher elevations. The unit is about 4 percent Oppio soils, 4 percent Old Camp soils, 4 percent Hefed soils, and 3 percent Duco soils.

The Yuko soil is very shallow and well drained. It formed in residuum mainly of volcanic rock. Typically, 3 to 15 percent of the surface is covered with stones and some cobbles. The surface layer is brown very stony loam about 3 inches thick. The subsoil is yellowish brown silty clay loam about 6 inches thick. Depth to highly weathered andesite ranges from 6 to 14 inches.

Permeability of the Yuko soil is moderately slow. Available water capacity is very low. Effective rooting depth is 6 to 14 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

The Reywat soil is shallow and well drained. It formed mainly in residuum of basic igneous rocks. Typically, 15 to 50 percent of the surface is covered with stones and some cobbles. The surface layer is a grayish brown extremely stony loam about 6 inches thick. The subsoil is brown very gravelly clay loam about 8 inches thick. Fractured, hard bedrock is at a depth of 14 inches. Depth to hard bedrock ranges from 10 to 20 inches.

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

Rock outcrop consists of barren volcanic rock on ridges and peaks.

This unit is used as rangeland.

The present vegetation in most areas of the Yuko soil is mainly big sagebrush, Anderson peachbrush, and green ephedra. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and steepness of slope.

The present vegetation in most of the Reywat soil is mainly big sagebrush, green ephedra, and cheatgrass. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because the available water capacity is very low and slope is steep.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

The main limitations to use of this unit as sites for roads are the shallowness over bedrock of the Reywat soil and the steepness of slope of both soils. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

350—Mizel very gravelly coarse sandy loam, 15 to 50 percent slopes. This very shallow, well drained soil is on uplands. It formed in residuum dominantly of rhyolite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 50 to 60 percent of the surface is covered with gravel. The surface layer is very pale brown very gravelly coarse sandy loam about 3 inches thick. Bedrock is at a depth of 3 inches. Depth to hard rhyolite ranges from 3 to 10 inches.

Included in this unit are Pahrange soils on smooth, slightly concave, higher slopes; Lemm soils on short alluvial fans and on lower, colluvial slopes; Verdico Variant soils in shallow depressions; and Rock outcrop that occurs on ridges. The unit is about 4 percent

Pahrange soils, 4 percent Lemm soils, 4 percent Verdico Variant soils, and 3 percent Rock outcrop.

Permeability of this Mizel soil is moderate. Available water capacity is very low. Effective rooting depth is 3 to 10 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If the unit is used for urban development, the main limitations for construction of dwellings are the steepness of slope and depth to bedrock. Heavy equipment is needed to cut into the bedrock.

The main limitations for use of this soil as septic tank absorption fields are the shallowness of the soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks in the rock into the ground water. In some areas, increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations for roads are depth to bedrock and steepness of slope. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The present vegetation in most areas is mainly Douglas rabbitbrush and bottlebrush squirreltail. The production of forage is limited by very low available water capacity and the restricted depth of the root zone over bedrock. The rating for rangeland seeding is very poor because of steepness of slope, very low available water capacity, and the restricted depth of the root zone over bedrock. Steepness of slope limits access by livestock and promotes overgrazing on the less sloping areas. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

351—Mizel-Skedaddle-Rock outcrop association. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 40 percent Mizel very gravelly coarse sandy loam, 15 to 50 percent slopes; 35 percent Skedaddle very stony loam, 15 to 70 percent slopes; and 10 percent Rock outcrop. The Mizel soil is on eroded, south-facing slopes. The Skedaddle soil is on eroded, north- and east-facing slopes. The Rock outcrop is on small peaks and ridges.

Incuded in this unit are Pahrange soils on smooth and slightly concave slopes, Zephan soils on lower colluvial slopes, Duco soils on ridges at higher elevations, and Lemm soils on short alluvial and colluvial slopes. The unit is about 4 percent Pahrange soils, 4 percent Zephan soils, 4 percent Duco soils, and 3 percent Lemm soils.

The Mizel soil is very shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, 50 to 60 percent of the surface is covered with gravel. The surface layer is very pale brown very gravelly coarse sandy loam about 3 inches thick. Bedrock is at a depth of 3 inches. Depth to hard rhyolite ranges from 3 to 10 inches.

Permeability of this Mizel soil is moderate. Available water capacity is very low. Effective rooting depth is 3 to 10 inches. Runoff is rapid, and the hazard water erosion is high. The hazard of soil blowing is slight.

The Skedaddle soil is very shallow and well drained. It formed in residuum derived dominantly from metavolcanic rock. Typically, 3 to 5 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 5 inches thick. Weathered bedrock is at a depth of 5 inches. Depth to hard bedrock ranges from 4 to 12 inches.

Permeability of the Skedaddle soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 12 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop consists of barren rock as small peaks and ridges.

The soils in this unit are used as rangeland.

The present vegetation in most areas of the Mizel soil is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, steepness of slope, and shallowness of the root zone.

The present vegetation in most areas of the Skedaddle soil is mainly big sagebrush, green ephedra, and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, steepness of slope, and the shallowness of the root zone over bedrock.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The main limitations to use of this unit as sites for roads are the shallowness of the soils over bedrock and the steepness of slope. Deep cuts should be avoided

because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

360—Pits. Pits are open excavations from which soil and, in places, some of the bedrock, have been removed. The excavated material has been used as construction material. The underlying material is variable.

370—Lemm very gravelly coarse sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from granodiorite. Elevation is 4,700 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 44 to 50 degrees F, and the average frost-free period is 80 to 100 days.

Typically, 40 to 50 percent of the surface is covered with gravel. The surface layer is grayish brown very gravelly coarse sandy loam about 19 inches thick. The subsoil is pale brown very gravelly coarse sandy loam about 21 inches thick. The substratum to a depth of 60 inches or more is very pale brown very gravelly loamy coarse sand.

Included in this unit are Indian Creek soils on higher terrace remnants, Cassiro soils on higher alluvial fan remnants, and Greenbrae soils on toe slopes of alluvial fans. The unit is about 5 percent Indian Creek soils, 5 percent Cassiro soils, and 5 percent Greenbrae soils.

Permeability of this Lemm soil is moderately rapid. Available water capacity of the soil is low. Effective rooting depth is 60 inches more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the moderately rapidly permeable subsoil. Because the subsoil is moderately rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Susceptibility to frost heaving limits the use of this unit for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush and antelope bitterbrush. The production of forage is limited by the moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

390—Duckhill stony loam, 30 to 50 percent slopes. This very shallow, well drained soil is on mountainous uplands. It formed in residuum derived dominantly from altered volcanic rock. Elevation is 5,700 to 7,000 feet. The average annual precipitation is 14 to 25 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 50 to 80 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is dark grayish brown stony loam about 3 inches thick. The subsoil is yellowish brown very gravelly light clay loam about 6 inches thick. Weathered bedrock is at a depth of 9 inches. Hard bedrock is at a depth of 12 inches. Depth to weathered bedrock ranges from 6 to 10 inches, and depth to hard bedrock ranges from 10 to 14 inches.

Included in this unit are Fraval soils on smooth, slightly concave slopes; Jumbo soils on colluvial north-facing slopes; and Rock outcrop that occurs as narrow ridges. The unit is about 5 percent Fraval soils, 5 percent Jumbo soils, and 5 percent Rock outcrop.

Permeability of this Duckhill soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 10 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as woodland.

The main limitations to use of this unit as sites for construction of dwellings are the steepness of slope and the shallowness of this soil over bedrock. Heavy equipment is needed to cut into the bedrock. The main limitations to use of this unit as septic tank absorption fields are the shallowness of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the shallowness of this soil over bedrock and steepness of slope. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of

merchantable timber is very low and natural regeneration of trees is difficult because of marginal precipitation, shallowness of this soil, and plant competition. If the woodland is to be maintained, only selective harvesting should be practiced. The steepness of slope limits the kinds of equipment that can be used in forest management. Management that minimizes the risk of erosion is essential in harvesting timber.

This soil is in capability subclass VIIs, nonirrigated.

391—Duckhill-Hirschdale-Fraval association. This map unit is on mountainous uplands. Elevation is 6,000 to 8,500 feet. The average annual precipitation is 20 to 45 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 50 to 60 days.

This unit is 35 percent Duckhill stony loam, 30 to 50 percent slopes; 30 percent Hirschdale very stony loam, 15 to 50 percent slopes; and 20 percent Fraval very stony loam, 30 to 50 percent slopes. The Duckhill soil is on steep uplands. The Hirschdale soil is on smooth slopes of uplands. The Fraval soil is on slightly convex slopes of uplands.

Included in this map unit are Duckhill Variant soils on steep ridges and peaks near Rock outcrop; Jumbo soils on lower, north-facing, colluvial slopes; Macareeno soils near streams and seeps; and Rock outcrop that occurs as small peaks and narrow ridges. The unit is about 4 percent Duckhill Variant soils, 4 percent Jumbo soils, 3 percent Macareeno soils, and 4 percent Rock outcrop. Also included near the California state line are small areas of Meiss soils on rims.

The Duckhill soil is very shallow and well drained. It formed in residuum dominantly of volcanic rock. Slope is 30 to 50 percent. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is dark grayish brown stony loam about 3 inches thick. The subsoil is yellowish brown very gravelly light clay loam about 6 inches thick. Weathered, altered andesite is at a depth of 9 inches. Depth to weathered bedrock ranges from 6 to 10 inches, and depth to hard bedrock ranges from 10 to 14 inches.

Permeability of the Duckhill soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 10 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Hirschdale soil is moderately deep and well drained. It formed in residuum dominantly of volcanic rock. Slope is 15 to 50 percent. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony loam about 6 inches thick. The subsoil is reddish brown clay about 33 inches thick. Weathered bedrock is at a depth of 39 inches. Depth to weathered bedrock ranges from 20 to 40 inches. Depth to hard bedrock ranges from 40 to 80 inches.

Permeability of the Hirschdale soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

The Fraval soil is moderately deep and well drained. It formed in residuum dominantly of volcanic rock. Slope is 30 to 50 percent. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is dark grayish brown very stony loam about 9 inches thick. The subsoil is brown very gravelly loam about 18 inches thick. Weathered tuff is at a depth of 27 inches. Depth to weathered tuff ranges from 20 to 40 inches.

Permeability of the Fraval soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as woodland.

The present vegetation on the Duckhill soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of merchantable timber is very low, and natural regeneration of trees is difficult because of marginal precipitation, shallowness of soil, and plant competition. If the woodland is to be maintained, only selective harvesting should be practiced. Management that minimizes the risk of erosion is essential. The steepness of slope limits the kind of equipment that can be used in forest management.

The present vegetation on the Hirschdale soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, mountainmahogany, muleears, and squawcarpet. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 3,300 cubic feet, or 14,400 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. The steepness of slope limits the kind of equipment that can be used in forest management.

The present vegetation on the Fraval soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and Sandberg bluegrass. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. The steepness of slope limits the kind of equipment that can be used in forest management.

The main limitations to the use of the unit as a site for roads are steepness of slope and depth to bedrock of the Duckhill soil, low strength, steepness of slope, and high clay content of the Hirschdale soil, and steepness of slope of the Fraval soil. Roads should be provided with a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided in the Duckhill soil because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

400—Jubilee Variant loamy sand, strongly saline. This very deep, poorly drained soil is on flood plains and alluvial fans. It formed in alluvium dominantly of granitic rock. Slopes are 0 to 2 percent. Elevation is 5,000 to 5,200 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is about 100 days.

Typically, the surface layer is very dark brown loamy sand about 14 inches thick. The underlying material to a depth of 60 inches is stratified sandy loam through loamy coarse sand.

Included in this map unit are Voltaire soils on low terrace remnants and Sagouspe soils near shallow channels. The unit is 8 percent Voltaire soils and 7 percent Sagouspe soils.

Permeability of this Jubilee Variant soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 18 to 36 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 18 to 36 inches in winter and spring. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks. This soil is moderately to strongly affected by sodium salts.

This unit is used for urban development and pasture.

Flooding is a limitation to use of the soil as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain.

The main limitation to use of the soil as septic tank absorption fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of the unit as sites for roads is the susceptibility of this soil to frost heaving. Drainage should be provided.

If this unit is used for unimproved pasture, the main limitations are salts, alkali, and the high water table. The present vegetation in most areas is mainly grass. An area-wide reclamation project would be beneficial if this unit is used for improved pasture or hayland. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill.

This soil is in capability subclasses IVw, irrigated, and VIIw, nonirrigated.

401—Jubilee Variant loamy sand, slightly saline. This very deep, poorly drained soil is on flood plains and alluvial fans. It formed in alluvium derived dominantly from granitic rock. Slopes are 0 to 2 percent. Elevation is 5,000 to 5,200 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is about 100 days.

Typically, the surface layer is very dark brown loamy sand about 14 inches thick. The underlying material to a depth of 60 inches is stratified sandy loam through loamy coarse sand.

Included in this unit are Voltaire soils on low terrace remnants and Sagouspe soils near shallow channels. The unit is about 8 percent Voltaire soils and 7 percent Sagouspe soils.

Permeability of the Jubilee Variant soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 18 to 36 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 18 to 36 inches in winter and spring. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks. The soil is slightly affected by sodium salts.

This unit is used for urban development and pasture.

Flooding is a limitation to use of this unit as sites for construction of dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this unit as sites for roads is the susceptibility of this soil to frost heaving. Roads should be provided with drainage.

If this unit is used for hay and pasture, the high water table and the concentration of salts and alkali are the main limitations. The present vegetation in most areas is mainly grass. Under a good management system, this soil will produce yields of 2 tons per acre of improved meadow hay or 6 animal-unit-months per acre of pasture. The high water table limits the leaching of salts from the surface layer. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for hay and pasture. Shallow-rooted, water-tolerant plants are suited to this soil. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations and to improve forage production. Applications of irrigation

water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alkali.

This soil is in capability subclass IVw, irrigated, and VIIw, nonirrigated.

403—Jubilee Variant loam, slightly saline. This very deep, poorly drained soil is on flood plains and alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Slopes are 0 to 2 percent. Elevation is 5,000 to 5,200 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is about 100 days.

Typically, the surface layer is very dark brown loam about 14 inches thick. The underlying material to a depth of 60 inches is stratified sandy loam through loamy coarse sand that is mottled and gleyed.

Included in this unit are Voltaire soils on low terrace remnants and Sagouspe soils near shallow channels. The unit is about 8 percent Voltaire soils and 7 percent Sagouspe soils.

Permeability of this Jubilee Variant soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants, but is limited to depths between 18 and 36 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 18 to 36 inches in winter and spring. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks. The soil is slightly affected by sodium salts.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this soil as sites for roads is the susceptibility of this soil to frost heaving. Roads should be provided with drainage.

If this unit is used for hay and pasture, a high water table and concentrations of salts and alkali are the main limitations. The present vegetation in most areas is mainly grass. Under a good management system, this soil will produce yields of 6 tons per acre of improved meadow hay or 2.5 animal-unit-months per acre of pasture. The high water table limits the leaching of salts from the surface layer. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for hay and pasture. Shallow-rooted, water-tolerant plants are suited to this soil. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations and to improve forage production. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alkali.

This soil is in capability subclasses IVw, irrigated, and VIw, nonirrigated.

410—Ophir loamy sand, 2 to 8 percent slopes. This very deep, poorly drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,700 to 5,400 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is very dark gray loamy sand about 11 inches thick. The underlying material to a depth of 60 inches is black and very dark gray loamy sand.

Included in this unit are Mottsville soils on the higher parts of alluvial fans and Jubilee soils on lower parts of alluvial fans and on flood plains. The unit is about 8 percent Mottsville soils and 7 percent Jubilee soils.

Permeability of this Ophir soil is rapid. Available water capacity is low. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 20 to 40 inches for water-sensitive plants. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 20 to 40 inches in late winter and spring. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

Flooding is a severe limitation to use of this unit as sites for dwellings. Flash floods can occur during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitations to use of this unit as septic tank absorption fields are the high water table and the rapidly permeable underlying material. Absorption fields should be designed to avoid raising the existing water table and polluting the water supplies. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The high water table and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

If this unit is used for hay and pasture, the main limitation is the high water table. The present vegetation in most areas is mainly grass. Under a good management system, this soil will produce yields of 2.5 tons per acre of improved meadow hay or 3 animal-unit-months per acre of pasture. Irrigation water must be carefully applied to avoid raising the water table. Shallow-rooted, water-tolerant plants are suited to this soil. Although the content of molybdenum in the soil does not reduce yields, the forage produced in some areas contains enough molybdenum to be toxic to livestock.

This soil is in capability subclass IIIw, irrigated.

411—Ophir loamy sand, 0 to 2 percent slopes. This very deep, poorly drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,700 to 5,400 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is black loamy sand about 12 inches thick. The underlying material to a depth of 60 inches is black and very dark gray, stratified gravelly coarse sand through sandy loam.

Included in this unit are Mottsville soils on the higher parts of alluvial fans and Jubilee soils on lower parts of alluvial fans and on flood plains. The unit is about 8 percent Mottsville soils and 7 percent Jubilee soils.

Permeability of this Ophir soil is rapid. Available water capacity is low. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 20 to 40 inches for water-sensitive plants. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 20 to 40 inches in late winter and spring. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

Flooding is a severe limitation to use of this unit as sites for construction of dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitations to use of this unit as septic tank absorption fields are the high water table and the rapidly permeable underlying material. Absorption fields should be designed to avoid raising the existing water table and polluting the water supplies. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The high water table and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Drainage is needed. Suitable material should be added to provide an adequate wearing surface.

If this unit is used for hay and pasture, the main limitation is the high water table. The present vegetation in most areas is mainly grass. Under a good management system, this soil will produce yields of 2.5 tons per acre of improved meadow hay or 3 animal-unit-months per acre of pasture. Irrigation water must be carefully applied to avoid raising the water table. Shallow-rooted, water-tolerant plants are suited to this soil. Although the content of molybdenum in this soil does not reduce yields, the forage produced in some areas contains enough molybdenum to be toxic to livestock.

This soil is in capability subclass IIIw, irrigated.

420—Godecke loamy sand. This very deep, somewhat poorly drained soil is on slightly concave to smooth terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,700 to 5,200 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown loamy sand about 5 inches thick. The subsoil is pale brown sandy clay loam about 10 inches thick. The substratum to a depth of 60 inches or more is stratified sandy loam through clay.

Included in this unit are Voltaire soils on flood plains; Dalzell soils on higher terrace remnants; Sagouspe Variant soils, which occur as narrow stringers near stream channels; and Incy soils on sand dunes. The unit is about 5 percent Voltaire soils, 5 percent Dalzell soils, 3 percent Sagouspe Variant soils, and 2 percent Incy soils.

Permeability of this Godecke soil is slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 36 to 60 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 30 to 40 inches in late winter and spring. The soil is slightly to moderately affected by sodium salts.

This unit is used for urban development and as rangeland.

The high clay content is a moderate limitation to use of this unit as sites for dwellings. The high clay content

results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitations to use of this unit as septic tank absorption fields are the high water table and the slowly permeable subsoil. Absorption fields should be designed to avoid raising the existing water table and polluting the water supplies. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field.

Low load-bearing strength is the main limitation to use of this soil as sites for roads. Suitable material should be added to strengthen the base.

The present vegetation in most areas is mainly black greasewood and saltgrass. The production of forage is limited by salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of salinity and alkalinity. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas to insure uniform grazing.

This soil is in capability subclass VIIw, nonirrigated.

423—Godecke Variant loamy sand. This deep, moderately well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,700 to 5,200 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown loamy sand about 12 inches thick. The subsoil is light yellowish brown sandy clay loam about 13 inches thick. The upper 17 inches of the substratum is sandy clay loam with a few thin strata that are weakly silica cemented. The lower part to a depth of 60 inches is a strongly cemented hardpan. Depth to the strongly cemented hardpan ranges from 40 to 60 inches.

Included in this unit are Surprise soils on higher parts of alluvial fans and along drainageways and Dalzell soils on lower-lying terraces. The unit is about 8 percent Surprise soils and 7 percent Dalzell soils.

Permeability of this Godecke Variant soil is slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 72 to 84 inches in late winter and spring. The soil is slightly affected by sodium salts.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

The high clay content is a moderate limitation to use of this unit as sites for dwellings. The high clay content can result in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

The high clay content and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Drainage is needed. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly black greasewood and saltgrass. The production of forage is limited by salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of salinity and alkalinity. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

This soil is in capability subclasses IVs, irrigated, and VIIs, nonirrigated.

430—Sagouspe Variant loamy very fine sand. This very deep, poorly drained soil is on flood plains and lake terraces. It formed in sandy alluvium derived dominantly from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 5,000 to 5,100 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is dark gray loamy very fine sand about 5 inches thick. The upper 17 inches of the underlying material is light brown sand with many yellowish red mottles. The lower part to a depth of 60 inches is light greenish gray, stratified sand and silt loam.

Included in this unit are Ophir soils on lower flood plains and unnamed soils that occur on flood plains and have clay or silty clay underlying material. The unit is about 8 percent Ophir soils and 7 percent unnamed soils.

Permeability of this Sagouspe Variant soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 20 to 36 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 20 to 36 inches in winter, spring, and early summer. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

Flooding and the high water table are limitations to use of this unit as sites for dwellings. Lowering the water table through drainage improves suitability as sites for

dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitations to use of this unit as sites for roads are the high water table and the susceptibility of this soil to frost heaving. Drainage should be provided. Suitable material should be added to provide an adequate wearing surface.

If this unit is used for hay and pasture, the main limitation is the high water table. The present vegetation in most areas is mainly grass. Under a good management system, this soil will produce yields of 2 tons per acre of improved meadow hay or 6 animal-unit-months per acre of pasture. Irrigation water must be carefully applied to avoid raising the water table. Shallow-rooted, water-tolerant plants are suited to this soil.

This soil is in capability subclasses IIIw, irrigated, and VIIw, nonirrigated.

431—Sagouspe Variant loamy very fine sand, wet. This very deep, poorly drained soil is on flood plains and lake terraces. It formed in sandy alluvium derived dominantly from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 5,000 to 5,100 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is dark gray loamy very fine sand about 5 inches thick. The upper 17 inches of the underlying material is light brown sand with many yellowish red mottles. The lower part to a depth of more than 60 inches is light greenish gray stratified sand and silt loam.

Included in this unit are Ophir soils on lower flood plains and unnamed soils that occur on flood plains and have clay or silty clay in the underlying material. The unit is about 8 percent Ophir soils and 7 percent unnamed soils.

Permeability of this Sagouspe Variant soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 6 to 20 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 6 to 20 inches in winter, spring, and early summer. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and unimproved pasture.

Flooding and the high water table are limitations to use of this unit as sites for dwellings. Lowering the water table through drainage improves suitability for use as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. It is difficult to establish and maintain structures for protection from such floods. The main limitation to use of this unit as septic tank absorption fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitations to use of this unit as sites for roads are the high water table and the susceptibility of this soil to frost heaving. Roads should be provided with drainage and an adequate wearing surface.

The present vegetation in most areas is mainly grass. If this unit is used for unimproved pasture, the main limitation is the high water table. An area-wide drainage project would be beneficial if this unit is used for improved pasture or hayland.

This soil is in capability subclass VIIs, nonirrigated.

440—Jubilee sandy loam. This very deep, poorly drained soil is on alluvial fans and flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,700 to 5,400 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 95 to 110 days.

Typically, the surface layer is black sandy loam about 22 inches thick. The underlying material to a depth of 60 inches is mottled, grayish brown, stratified loamy coarse sand through fine sandy loam.

Included in this map unit are Ophir soils on lower-lying flood plains and Jubilee Variant soils on the lower parts of the unit. The unit is 8 percent Ophir soils and 2 percent Jubilee Variant soils.

Permeability of this Jubilee soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 20 to 30 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 20 to 30 inches in winter and spring. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks. This unit is used for urban development, crops, pasture, and hayland.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation for septic tank absorption

fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this unit as sites for roads is the susceptibility of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

If this unit is used for irrigated crops, the main limitation is the high water table. Under good management, including a conservation cropping system, 3.5 tons per acre of alfalfa or 42 bushels per acre of barley can be expected. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid overirrigating and leaching of plant nutrients.

If this unit is used for hay and pasture, the main limitation is the high water table. The present vegetation in most areas is mainly grasses, juncus, sedges, and various clovers. Under a good pasture or hayland management system, yields of 3.5 tons per acre of alfalfa, 3 tons per acre of improved meadow hay, or 8 animal-unit-months per acre of pasture can be expected. Irrigation water must be carefully applied to avoid raising the water table. Shallow-rooted, water-tolerant plants are suited to this soil.

This soil is in capability subclass IIIw, irrigated.

441—Jubilee clay loam. This very deep, poorly drained soil is on alluvial fans and flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,700 to 5,400 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 95 to 110 days.

Typically, the surface layer is very dark brown clay loam about 11 inches thick. The underlying material to a depth of 60 inches is stratified fine sandy loam through coarse sand.

Included in this unit are Ophir soils on lower lying flood plains and Jubilee Variant soils on the lower parts of the unit. The unit is about 8 percent Ophir soils and 7 percent Jubilee Variant soils.

Permeability of this Jubilee soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 20 to 30 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 20 to 30 inches in winter and spring. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development, crops, pasture, and hayland.

Flooding is a severe limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this unit as sites for roads is the susceptibility of this soil to frost heaving. Roads should be provided with drainage and an adequate wearing surface.

If this unit is used for irrigated crops, the main limitation is the high water table. Under good management, including a conservation cropping system, this soil can produce 3.5 tons per acre of alfalfa or 42 bushels per acre of barley. Aplications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

If this unit is used for hay and pasture, the main limitation is the high water table. The present vegetation in most areas is mainly grasses, sedges, various clovers, and juncus. Under a good management system, this soil can produce yields of 3.5 tons per acre of alfalfa, 3 tons per acre of improved meadow hay, or 8 animal-unit-months per acre of pasture. Irrigation water must be carefully applied to avoid raising the water table.

This soil is in capability subclass IIIw, irrigated.

442—Jubilee gravelly sand. This very deep, poorly drained soil is on alluvial fans and flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,700 to 5,400 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 95 to 110 days.

Typically, the surface layer is pale brown gravelly sand overwash about 11 inches thick. Below this is a buried surface layer of black sandy loam about 17 inches thick. The underlying material to a depth of 60 inches is olive gray, stratified loamy fine sand, sandy loam, and coarse sand.

Included in this unit are Voltaire soils in swales and Ophir soils on lower-lying flood plains. The unit is about 8 percent Voltaire soils and 7 percent Ophir soils.

Permeability of this Jubilee soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 20 to 30 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 20 to 30 inches in winter and spring. This soil is subject to flash flooding during storms

of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development, pasture, and hayland.

Flooding is a severe limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this soil as sites for roads is the susceptibility of this soil to frost heaving. Roads should be provided with drainage and an adequate wearing surface.

If this unit is used for hay and pasture, the main limitation is the high water table. The present vegetation in most areas is mainly grass, various clovers, juncus, and sedges. Under a good management system, this soil can produce yields of 2 tons per acre of improved meadow hay or 6 animal-unit-months per acre of pasture. Irrigation water must be carefully applied to avoid raising the water table. Shallow-rooted, water-tolerant plants are suited to this soil.

This soil is in capability subclass IIIw, irrigated.

443—Jubilee loamy sand. This very deep, poorly drained soil is on alluvial fans and terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,700 to 5,400 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 95 to 110 days.

Typically, the surface layer is very dark brown loamy sand about 12 inches thick. Below this is a buried surface layer of mottled, very dark gray and olive fine sandy loam about 18 inches thick. The underlying material to a depth of 60 inches is olive gray, stratified fine sandy loam through coarse sand.

Included in this unit are Ophir soils on lower lying flood plains and Jubilee Variant soils on the lower parts of the unit. The unit is about 8 percent Ophir soils and 7 percent Jubilee Variant soils.

Permeability of this Jubilee soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 18 to 30 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 20 to 30 inches in winter and spring. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development, crops, pasture, and hayland.

Flooding is a severe limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The susceptibility of this soil to frost heaving is the main limitation to use of this unit as sites for construction of roads. Roads should be provided with drainage and an adequate wearing surface.

If this unit is used for irrigated crops, the main limitation is the high water table. Under good management, including a conservation cropping system, this soil can produce yields of 3.5 tons per acre of alfalfa hay or 42 bushels per acre of barley. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

If this unit is used for hay and pasture, the main limitation is the high water table. Shallow-rooted, water-tolerant plants are suited to this soil. The present vegetation in most areas is mainly grasses, sedges, clovers, and juncus. Under a good management system, this soil can produce yields of 3.5 tons per acre of alfalfa, 3 tons per acre of improved meadow hay, or 8 animal-unit-months per acre of pasture. Irrigation water must be carefully applied to avoid raising the water table.

This soil is in capability subclass IIIw, irrigated.

445—Jubilee sandy loam, drained. This very deep soil is on alluvial fans and flood plains. The drainage has been altered. The soil formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,700 to 5,400 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 95 to 110 days.

Typically, the surface layer is dark gray sandy loam about 22 inches thick. The underlying material to a depth of 60 inches is dark grayish brown, stratified, mottled loamy coarse sand and fine sandy loam.

Included in this unit are Voltaire soils in swales, Truckee soils on lower flood plains, and Vamp soils on low terrace remnants. The unit is about 5 percent Voltaire soils, 5 percent Truckee soils, and 5 percent Vamp soils.

Permeability of this Jubilee 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 slight. A seasonal high water table is at a depth of 48 to 72 inches in winter and early spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

Flooding is a severe limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The flooding and the high water table are moderate limitations to use of this unit as septic tank absorption fields. Absorption fields should be designed to avoid raising the existing water table and polluting the water supplies. Dikes and channels that have outlets to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

Flooding and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Drainage should be provided.

If this unit is used for pasture, the main limitation is wetness. The present vegetation is mainly sedges, clovers, juncus, and grasses. Under a good management system, this soil can produce yields of 4.5 tons per acre of alfalfa, 3.5 tons per acre of improved meadow hay, or 9 animal-unit-months per acre of pasture. Irrigation water must be carefully applied to avoid raising the water table. Water-tolerant plants are suited to this soil.

This soil is in capability subclass IIIw, irrigated.

450—Voltaire loam. This very deep, poorly drained and very poorly drained soil is on alluvial fans and flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,400 to 5,200 feet. The average annual precipitation is about 7 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is gray loam about 20 inches thick. The underlying material to a depth of 60 inches is gray, mottled, stratified silty clay loam through loamy sand.

Included in this unit are Fettic soils on slightly higher terraces, Jubilee Variant soils near shallow stream channels, and Truckee soils on slightly higher parts of the flood plain. The unit is about 5 percent Fettic soils, 5 percent Jubilee Variant soils, and 5 percent Truckee soils.

Permeability of this Voltaire soil is slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 0 to 18 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 0 to 18 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development, pasture, and hayland. It can be used for irrigated crops if water is available.

Flooding and the high water table are limitations to use of this unit as sites for dwellings. Lowering the water table through drainage improves suitability for use as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this unit as septic tank absorption fields are the high water table and the slowly permeable underlying material. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitations to use of this soil as sites for roads are the low load-bearing strength, high water table, and susceptibility of this soil to frost heaving. Suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be provided with drainage.

If this unit is used for hay and pasture, the main limitation is the high water table. The present vegetation in most areas is grass. Under a good management system, yields of 2 tons per acre of improved meadow hay or 6 animal-unit-months per acre of pasture can be expected. Irrigation water must be carefully applied to avoid raising the water table. Shallow-rooted, water-tolerant plants are suited to this soil.

This soil is in capability subclasses IVw, irrigated, and VIw, nonirrigated.

451—Voltaire loam, slightly saline. This very deep, poorly drained and very poorly drained soil is on alluvial fans and flood plains. It formed in alluvium derived dominantly from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,400 to 5,200 feet. The average annual precipitation is about 7 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is black loam about 15 inches thick. The underlying material to a depth of 60 inches is dark grayish brown, mottled, stratified silty clay loam through loamy sand.

Included in this unit are Fettic soils on slightly higher terraces, Jubilee Variant soils near shallow stream channels, and Truckee soils on slightly higher parts of flood plains. The unit is about 5 percent Fettic soils, 5 percent Jubilee Variant soils, and 5 percent Truckee soils.

Permeability of this Voltaire soil is slow. Available water capacity is high. Effective rooting depth is 60

inches for water-tolerant plants but is limited to 0 to 18 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 0 to 18 inches in late winter and early spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. The soil is slightly affected by sodium salt.

This unit is used for urban development, pasture, and hayland. It can be used for irrigated crops if water is available.

Flooding and the high water table are severe limitations to use of this unit as sites for dwellings. Lowering the water table through drainage improves suitability for use as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this unit as septic tank absorption fields are the high water table and the slowly permeable underlying material. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitations to use of this unit as sites for roads are the low load-bearing strength, high water table, and susceptibility of this soil to frost heaving. Suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be provided with drainage.

If this unit is used for hay and pasture, the main limitations are the high water table and concentrations of salt and alkali. The present vegetation in most areas is mainly grass. Under a good management system, this soil can produce yields of 1.5 tons per acre of improved meadow hay or 5 animal-unit-months per acre of pasture. The high water table limits the leaching of salts from the surface layer. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for hay and pasture. Shallow-rooted, water-tolerant plants are suited to this soil. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations and to improve forage production. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alkali.

This soil is in capability subclasses IVw, irrigated, and VIw, nonirrigated.

452—Voltaire loam, strongly saline. This very deep, poorly drained and very poorly drained soil is on alluvial fans and flood plains. It formed in alluvium derived dominantly from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,400 to 5,200 feet. The average annual precipitation is about 7 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is black loam about 18 inches thick. The underlying material to a depth of 60 inches is stratified, dark grayish brown silty clay loam through loamy sand.

Included in this unit are Fettic soils on slightly higher terraces, Jubilee Variant soils near shallow stream channels, and Truckee soils on slightly higher parts of flood plains. The unit is about 5 percent Fettic soils, 5 percent Jubilee Variant soils, and 5 percent Truckee soils.

Permeability of this Voltaire soil is slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to depths of 0 to 18 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 0 to 18 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. The soil is strongly affected by sodium salt.

This unit is used for urban development and as rangeland.

Flooding and the high water table are limitations to use of this unit as sites for dwellings. Lowering the water table through drainage improves suitability for use as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this unit as septic tank absorption fields are the high water table and the slowly permeable underlying material. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitations to the use of this unit as sites for roads are the low load-bearing strength, high water table, and susceptibility of this soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas is mainly black greasewood and saltgrass. The production of forage is limited by salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of salinity and alkalinity. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

This soil is in capability subclass VIIw, nonirrigated.

454—Voltaire silty clay, drained. This very deep, poorly drained and very poorly drained soil is on flood plains. Drainage has been altered. The soil formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,400 to 4,500 feet. The average annual precipitation is about 7 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is gray, mottled silty clay about 20 inches thick. The underlying material to a depth of 60 inches is gray, mottled silty clay loam with thin strata of silt loam to loamy sand.

Included in this unit are Fettic soils on slightly higher terraces, Jubilee Variant soils near shallow stream channels, and Truckee soils on slightly higher parts of the flood plains. The unit is about 5 percent Fettic soils, 5 percent Jubilee Variant soils, and 5 percent Truckee soils.

Permeability of this Voltaire 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 slight. A seasonal high water table is at a depth of 60 to 72 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitation to use of this unit as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

The main limitation to use of this unit as sites for roads is low load-bearing strength. Suitable material should be added to strengthen the base.

455—Voltaire-Truckee complex, drained. This map unit is on flood plains. Elevation is 4,400 to 5,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 45 percent Voltaire silty clay, 0 to 2 percent slopes, and 40 percent Truckee silt loam, 0 to 2 percent slopes. The Voltaire soil occurs in the swales and on the lower part of the flood plain, and the Truckee soil occurs on the slightly higher part of the flood plain. Areas of these soils are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Fettic soils on slightly higher terraces and Jubilee Variant soils near shallow stream channels. The unit is about 8 percent Fettic soils and 7 percent Jubilee Variant soils.

The Voltaire soil is a very deep soil, and the drainage has been altered. The soil formed in alluvium derived dominantly from mixed rock. Slopes are 0 to 2 percent. Typically, the surface layer is gray, mottled silty clay about 20 inches thick. The underlying material to a depth of 60 inches is gray, mottled silty clay loam.

Permeability of the Voltaire 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. A seasonal high water table is at a depth of 60 to 72 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

The Truckee soil is very deep, and the drainage has been altered to well drained. The soil formed in alluvium derived dominantly from mixed rock. Slopes are 0 to 2 percent. Typically, the surface layer is grayish brown silt loam about 12 inches thick. The underlying material to a depth of 60 inches is light brown stratified sandy loam through silty clay loam.

Permeability of the Truckee 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 slight. A seasonal high water table is at a depth of 72 to 84 inches in winter through summer. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. The soil is slightly affected by sodium salt.

This unit is used for urban development.

Flooding is a limitation to use of this unit as sites for dwellings. These soils are subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this unit as septic tank absorption fields are the slow permeability of the Voltaire soil and the moderately slow permeability of the Truckee soil. The limitations can be overcome by increasing the size of the absorption field.

The main limitation to use of this unit as sites for roads are the low load-bearing strength of the Voltaire soil and the susceptibility to frost heaving of the Truckee soil. Roads should be provided with drainage, and suitable material should be added to strengthen the base.

456—Voltaire clay loam, gravelly substratum. This very deep, poorly drained soil is on flood plains. Drainage has been altered. This soil formed in alluvium derived from mixed rock. Slopes are 0 to 2 percent. Elevation is 4,400 to 5,200 feet. The average annual precipitation is about 7 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is dark gray clay loam about 9 inches thick. The upper part of the underlying

material to a depth of 36 inches is gray, mottled, stratified clay to silt loam. Below a depth of 36 inches is stratified very gravelly coarse sand through sandy clay loam.

Included in this unit are Fettic soils on low terraces, Jubilee Variant soils on alluvial fans, and Truckee soils on slightly higher parts of the flood plains and fans. The unit is about 5 percent Fettic soils, 5 percent Jubilee Variant soils, and 5 percent Truckee soils.

Permeability of this Voltaire soil is slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 40 to 72 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. Some areas are slightly affected by salts and alkali.

This unit is used for urban development.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this unit as septic tank absorption fields are the high water table and the slowly permeable underlying material. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and susceptibility of this soil to frost heaving. Suitable material should be added to strengthen the base. Drainage is needed.

460—Surprise loamy sand, 2 to 4 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 4,700 to 5,600 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is about 100 to 110 days.

Typically, the surface layer is grayish brown loamy sand about 14 inches thick. The subsoil is light yellowish brown gravelly sandy loam about 23 inches thick. The substratum to a depth of 66 inches or more is brown, stratified sandy loam to gravelly loamy sand.

Included in this unit are Greenbrae soils on toe slopes of alluvial fans, Indian Creek soils on older and higher terrace remnants, Incy soils on sand dunes, and Holbrook soils that are in drainageways and are flooded for short periods in most years. The unit is about 5 percent Greenbrae soils, 5 percent Indian Creek soils, 3 percent Incy soils, and 2 percent Holbrook soils.

Permeability of this Surprise soil is moderately rapid. Available water capacity of the soil 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings and to use as septic tank absorption fields. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain.

Flooding and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Drainage should be provided.

The present vegetation in most areas of this soil is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. The production of forage is limited by the moderately low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIIs, irrigated, and VIs, nonirrigated.

461—Surprise coarse sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,700 to 5,600 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is about 100 to 110 days.

Typically, the surface layer is grayish brown coarse sandy loam about 7 inches thick. The subsoil is light yellowish brown gravelly sandy loam about 17 inches thick. The substratum to a depth of 66 inches or more is brown, stratified sandy loam to gravelly loamy sand.

Included in this unit are Holbrook soils near drainageways, Indian Creek soils on older and higher terrace remnants, Incy soils on sand dunes, and Holbrook soils that are in drainageways and are flooded for short periods in most years. The unit is about 5 percent Holbrook soils near drainageways, 5 percent Indian Creek soils, 3 percent Incy soils, and 2 percent Holbrook soils in drainageways.

Permeability of this Surprise 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this soil as sites for dwellings and as septic tank absorption fields. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain.

Flooding and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. The production of forage is limited by the moderately low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIIe, irrigated, and VIs, nonirrigated.

470—Dalzell loamy fine sand. This moderately deep, somewhat poorly drained soil is on low lake terraces. It formed in alluvium derived dominantly from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,000 to 5,100 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 49 to 52 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is light brownish gray loamy fine sand about 14 inches thick. The subsoil is pale brown sandy clay loam about 18 inches thick. The upper 4 inches of the substratum is a strongly silica-cemented hardpan. The lower part to a depth of 60 inches is stratified loamy sand, gravelly coarse sand, and sandy loam. Depth to the strongly silica-cemented hardpan ranges from 20 to 40 inches.

Included in this unit are Godecke soils on remnant lake terraces, Incy soils on sand dunes, Surprise soils on toe slopes of alluvial fans, and Playas. This unit is about 5 percent Godecke soils, 5 percent Incy soils, 3 percent Surprise soils, and 2 percent Playas.

Permeability of this Dalzell soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 40 to 60 inches in late winter and spring. This soil is slightly to moderately affected by sodium salts.

This unit is used for urban development and as rangeland and pasture. It can be used for irrigated crops if water is available.

If this unit is used for urban development, this soil is well suited to use as sites for dwellings. The main limitations to use of this unit as septic tank absorption fields are the hardpan and the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the soil is drained, percolation can be improved in some areas by placing the leach line below the hardpan; however, care must be taken to avoid contamination of ground water.

The susceptibility of this soil to frost heaving is a moderate limitation to use of the unit as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, black greasewood, and saltgrass. The production of forage is limited by salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor. Salinity and alkalinity are the main limitations to seeding. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

If this unit is used for unimproved pasture, the main limitations are concentrations of salts and alkali and the high water table. An area-wide drainage project would be beneficial if this unit is used for improved pasture.

This soil is in capability subclasses IVw, irrigated, and VIIw, nonirrigated.

480—Holbrook gravelly loamy sand, 2 to 8 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,400 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 25 to 35 percent of the surface is covered with gravel. The surface layer is brown gravelly loamy sand about 8 inches thick. The subsoil is pale brown gravelly sandy loam about 6 inches thick. The substratum to a depth of 60 inches is stratified very gravelly fine sandy loam through gravelly sand.

Included in this unit are Surprise soils on lower slopes of alluvial fans; Springmeyer soils on higher terrace remnants; and Holbrook soils, which occur in stream channels and are flooded for short periods in most years. The unit is about 5 percent Surprise soils, 5 percent Springmeyer soils, and 5 percent Holbrook soils.

Permeability of this Holbrook soil is moderately 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flooding is also the main limitation to use of this unit as septic tank absorption fields. Flash floods

can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain.

Flooding and susceptibility to frost heaving are moderate limitations to use of this soil as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. The production of forage is limited by the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because the available water capacity of the surface layer is very low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclasses IVe, irrigated, and VIIs, nonirrigated.

482—Holbrook cobbly loamy sand, 2 to 8 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,400 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 25 to 35 percent of the surface is covered with cobbles. The surface layer is brown cobbly loamy sand about 10 inches thick. The underlying material to a depth of 60 inches is stratified stony sand through very gravelly loam.

Included in this unit are Surprise soils on lower slopes of alluvial fans; Springmeyer soils on higher terrace remnants; and Holbrook soils, which occur in channels and are flooded for short periods in most years. The unit is about 5 percent Surprise soils, 5 percent Springmeyer soils, and 5 percent Holbrook soils.

Permeability of this Holbrook soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of soil blowing is slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this soil as sites for dwellings. Flooding is also the main limitation to use of this unit as septic tank absorption fields. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain.

Flooding and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. The production of forage is limited by the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

490—Graufels bouldery sand, 8 to 15 percent slopes. This moderately deep, somewhat excessively drained soil is on uplands. It formed in residuum derived dominantly from granitic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 120 days.

Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery sand about 10 inches thick. The underlying material to a depth of 22 inches is light yellowish brown gravelly loamy coarse sand. Weathered granitic bedrock is at a depth of 22 inches. Depth to weathered granitic bedrock ranges from 20 to 40 inches.

Included in this unit are Mottsville soils on colluvial slopes and short alluvial fans, Luppino soils on pediment remnants, and Rock outcrop that occurs as isolated peaks. The unit is about 6 percent Mottsville soils, 6 percent Luppino soils, and 3 percent Rock outcrop.

Permeability of this Graufels soil is rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

Steepness of slope is a moderate limitation to use of this unit as sites for dwellings. The main limitation to use of this unit as septic tank absorption fields is the restricted depth of this soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

Steepness of slope is a moderate limitation to use of this unit as sites for roads. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and cheatgrass. The production of forage is limited by the restricted depth of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more

desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

491—Graufels-Rock outcrop complex, 15 to 30 percent slopes. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 120 days.

This unit is 75 percent Graufels bouldery sand, 15 to 30 percent slopes, and 15 percent Rock outcrop. The Graufels soil is on side slopes of uplands, and the Rock outcrop is on ridges and peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Mottsville soils on colluvial slopes and short alluvial fans, Luppino soils on pediment remnants, and Linhart soils along narrow bottoms of drainageways. The unit is about 4 percent Mottsville soils, 4 percent Luppino soils, and 2 percent Linhart soils.

The Graufels soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery sand about 10 inches thick. The underlying material to a depth of 22 inches is light yellowish brown gravelly loamy coarse sand. Weathered granitic bedrock is at a depth of 22 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Graufels soils is rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of granitic rocks as small peaks or ridges.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the restricted depth of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this unit as sites for roads is the steepness of slope. Roads should be built in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and antelope bitterbrush. The production of forage is limited by the restricted depth of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

The soil in this unit is in capability subclass VIIs, nonirrigated.

492—Graufels bouldery sand, 15 to 30 percent slopes. This moderately deep, somewhat excessively drained soil is on uplands. It formed in residuum derived dominantly from granitic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 120 days.

Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery sand about 12 inches thick. The underlying material to a depth of 26 inches is light yellowish brown gravelly loamy coarse sand. Weathered granitic bedrock is at a depth of 26 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Included in this unit are Mottsville soils on colluvial slopes and short alluvial fans; Acrelane soils on smooth, slightly concave slopes; Linhart soils along narrow bottoms of drainageways; and Rock outcrop that occurs as isolated peaks. The unit is about 5 percent Mottsville soils, 5 percent Acrelane soils, 3 percent Linhart soils, and 2 percent Rock outcrop.

Permeability of this Graufels soil is rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the restricted depth of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by the restricted depth of the root zone over bedrock and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

493—Graufels-Glenbrook complex, 8 to 50 percent slopes. This map unit is on uplands. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 120 days.

This unit is 60 percent Graufels gravelly loamy coarse sand, 15 to 50 percent slopes, and 25 percent Glenbrook cobbly sand, 8 to 30 percent slopes. The Graufels soil is on side slopes of uplands. The Glenbrook soil is on tops of uplands along dikes. The areas of these soils are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Tanob soils at higher elevations on smooth slopes and shallow depressions, Haypress soils near high ridges and peaks, Koontz soils on metavolcanic ridges, and Rock outcrop that occurs as isolated peaks. The unit is about 4 percent Tanob soils, 3 percent Haypress soils, 3 percent Koontz soils, and 5 percent Rock outcrop.

The Graufels soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is dark grayish brown gravelly loamy coarse sand about 11 inches thick. The underlying material to a depth of 25 inches is light yellowish brown gravelly loamy coarse sand. Weathered granitic bedrock is at a depth of 20 inches. Depth to weathered granitic bedrock ranges from 25 to 40 inches.

Permeability of the Graufels soil is rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Glenbrook soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from granitic rock. Typically, 15 to 25 percent of the surface is covered with cobbles. The surface layer is grayish brown cobbly sand about 7 inches thick. The underlying material to a depth of 13 inches is light brownish gray gravelly loamy coarse sand. Weathered bedrock is at a depth of 13 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

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

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for construction of dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the restricted depth of the soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this unit as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation is most areas is mainly big sagebrush, Anderson peachbrush, and antelope bitterbrush. The production of forage is limited by the restricted depth of the root zone over bedrock and the very low available water capcity. The suitability of this soil for rangeland seeding is very poor, mainly because of steepness of slope, the very low available water capacity of the surface layer, and the restricted depth of the root zone over bedrock. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

The soils are in capability subclass VIIe, nonirrigated.

494—Graufels gravelly loamy coarse sand, 4 to 8 percent slopes. This moderately deep, somewhat excessively drained soil is on uplands. It formed in residuum dominantly of granitic rocks. Elevation is 4,500 to 6,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 120 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is dark grayish brown gravelly loamy coarse sand about 9 inches thick. The underlying material to a depth of 24 inches is light yellowish brown gravelly loamy coarse sand. Weathered

granitic bedrock is at a depth of 24 inches. Depth to weathered granitic bedrock ranges from 20 to 40 inches.

Included in this unit are Mottsville soils on colluvial slopes and short alluvial fans, Luppino soils on pediment remnants, Linhart soils along narrow bottoms of drainageways, and Rock outcrop that occurs as isolated peaks. The unit is about 6 percent Mottsville soils, 4 percent Luppino soils, 3 percent Linhart soils, and 2 percent Rock outcrop.

Permeability of this Graufels soil is rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

This soil is well suited to use as sites for dwellings. The main limitation to use of this unit as septic tank absorption fields is the restricted depth to bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

Roads can easily be constructed and maintained on this soil.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by the restricted depth of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

495—Graufels-Glenbrook-Rock outcrop complex, 4 to 15 percent slopes. This map unit is on uplands. Elevation is 4,700 to 6,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 120 days.

This unit is 60 percent Graufels gravelly loamy coarse sand, 4 to 8 percent slopes; 20 percent Glenbrook cobbly sand, 8 to 15 percent slopes; and 10 percent Rock outcrop. The Graufels soil is on smooth tops of uplands. The Glenbrook soil is on intrusive dikes of uplands, and Rock outcrop is on ridges and peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Luppino soils on pediments and Mottsville soils on colluvial slopes and short alluvial fans. The unit is about 5 percent Luppino soils and 5 percent Mottsville soils.

The Graufels soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is dark grayish brown gravelly loamy coarse sand about 9 inches thick. The underlying material to a depth of 23 inches is light yellowish brown gravelly loamy coarse sand. Weathered granitic bedrock is at a depth of 23 inches. Depth to weathered granitic bedrock ranges from 20 to 40 inches.

Permeability of the Graufels soil is rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Glenbrook soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 15 to 25 percent of the surface is covered with cobbles. The surface layer is grayish brown cobbly sand about 7 inches thick. The underlying material to a depth of 13 inches is light brownish gray gravelly loamy coarse sand. Weathered bedrock is at a depth of 13 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

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

Rock outcrop consists mainly of apatite dikes.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the steepness of slope and shallowness over bedrock of the Glenbrook soil are moderate limitations to use as sites for dwellings. Heavy equipment is needed to cut into the bedrock. The main limitation to use of this unit as septic tank absorption fields is restricted depth to bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The steepness of slope and shallowness over bedrock of the Glenbrook soil are moderate limitations to use of this unit as sites for roads. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Heavy equipment is needed to cut into the bedrock.

The present vegetation in most areas is mainly big sagebrush, green ephedra, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by the restricted depth of the root zone over bedrock and

the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

These soils are in capability subclass VIIs, nonirrigated.

496—Graufels-Glenbrook-Haypress association. This map unit is on uplands. Elevation is 6,000 to 7,000 feet. The average annual precipitation is about 10 to 16 inches, the average annual air temperature is 45 to 49 degrees F, and the average frost-free period is 60 to 100 days.

This unit is 35 percent Graufels gravelly loamy coarse sand, 30 to 50 percent slopes; 30 percent Glenbrook cobbly sand, 30 to 70 percent slopes; and 20 percent Haypress very bouldery loamy coarse sand, 30 to 70 percent slopes. The Graufels soil is on south-facing slopes of uplands. The Glenbrook soil is on ridges and on eroded south-facing slopes. The Haypress soil is on north-facing slopes of uplands and on higher elevations.

Included in this unit are Mottsville soils on colluvial slopes and short alluvial fans, Luppino soils on gently to strongly sloping pediment remnants, and Rock outcrop that occurs as isolated peaks. The unit is about 5 percent Mottsville soils, 5 percent Luppino soils, and 5 percent Rock outcrop.

The Graufels soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is dark grayish brown gravelly loamy coarse sand about 15 inches thick. The underlying material to a depth of 26 inches is light yellowish brown gravelly loamy coarse sand. Weathered granitic bedrock is at a depth of 26 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Graufels soil is rapid. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Glenbrook soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 15 to 20 percent of the surface is covered with cobbles. The surface layer is grayish brown cobbly sand about 12 inches thick. The underlying material to a depth of 18 inches is light brownish gray gravelly loamy coarse sand. Weathered bedrock is at a depth of 18 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

Permeability of the Glenbrook soil is rapid. 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 slight.

The Haypress soil is deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 5 to 10 percent of the surface is covered with stones and boulders. The surface layer is very bouldery loamy coarse sand about 15 inches thick. The underlying material to a depth of 46 inches is gravelly coarse sand or gravelly loamy coarse sand. Weathered bedrock is at a depth of 46 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Haypress soil is rapid. Available water capacity is very low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Graufels soil is mainly big sagebrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by the very low available water capacity and restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and the steepness of slope.

The present vegetation in most areas of the Glenbrook soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor because of the very low available water capacity of the surface layer, steepness of slope, and the shallowness of the root zone over bedrock.

The present vegetation in most areas of the Haypress soil is mainly big sagebrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by the very low available water capacity, the short growing season, and the cold temperature in spring. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and the steepness of slope.

Cold soil temperatures delay plant growth and readiness for grazing. Grazing should be delayed until the soils are warm and the plants have achieved sufficient growth. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. To ensure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

The main limitation to use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

This Graufels soil is in capability subclass VIIe, nonirrigated. The Glenbrook and Haypress soils are in capability subclass VIIs, nonirrigated.

500—Mottsville sand, 0 to 4 percent slopes. This very deep, excessively drained soil is on alluvial fans. It formed in alluvium derived mainly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is grayish brown sand about 10 inches thick. The underlying material to a depth of 60 inches is light brownish gray stratified gravelly coarse sand to loamy sand.

Included in this unit are Linhart soils on inset alluvial fans and next to drainageways, Bedell soils on remnants between drainageways, and Spasprey soils on lower terrace remnants adjacent to toe slopes of alluvial fans. Also included in an area near Washoe Lake is a sandy soil that has a seasonal high water table at a depth of 3 to 5 feet during late winter and spring. This unit is about 5 percent Linhart soils, 5 percent Bedell soils, and 5 percent Spasprey soils.

Permeability of this Mottsville soil is rapid to very rapid. Available water capacity of the soil is low. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to flash-flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this soil as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. Rapid permeability is a limitation to use of this unit as septic tank absorption fields. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Flooding is a moderate limitation to use of this soil as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. The duration and intensity of grazing should be adjusted to season of growth and to precipitation. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVs, irrigated and VIIs, nonirrigated.

504—Mottsville sand, 8 to 15 percent slopes. This very deep, excessively drained soil is on alluvial fans. It formed in alluvium mainly derived from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is grayish brown sand about 10 inches thick. The underlying material to a depth of 60 inches is light brownish gray stratified gravelly coarse sand to loamy sand.

Included in this unit are Linhart soils on inset alluvial fans and next to drainageways, Bedell soils on remnants between drainageways, and Spasprey soils on lower terrace remnants adjacent to toe slopes of alluvial fans. This unit is about 5 percent Linhart soils, 5 percent Bedell soils, and 5 percent Spasprey soils.

Permeability of this Mottsville soil is rapid to very rapid. Available water capacity of the soil is low. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to flash-flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to construction of dwellings on areas of this unit. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is rapid permeability. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Steepness of slope and flooding are moderate limitations to use of this soil as sites for roads. Roads should be provided with drainage. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. The production of forage is limited by moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. The duration and intensity of grazing should be adjusted to season of growth and precipitation. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVs, irrigated and VIIs, nonirrigated.

505—Mottsville gravelly coarse sand, 4 to 8 percent slopes. This very deep, excessively drained soil is on alluvial fans. It formed in alluvium derived mainly from granitic rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 10 to 12 inches,

the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is grayish brown gravelly coarse sand about 11 inches thick. The underlying material to a depth of 60 inches is light brownish gray stratified gravelly coarse sand to loamy sand.

Included in this unit are Linhart soils on inset alluvial fans and next to drainageways, Bedell soils on remnants between drainageways, and Spasprey soils on lower terrace remnants adjacent to toe slopes of alluvial fans. The unit is about 5 percent Linhart soils, 5 percent Bedell soils, and 5 percent Spasprey soils.

Permeability of this Mottsville soil is rapid to very rapid. Available water capacity is low. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

This soil is well suited to use as sites for the construction of dwellings. Rapid permeability is a limitation to use of this unit as septic tank absorption fields. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Roads can easily be constructed and maintained on this soil.

The present vegetation in most areas of this soil is mainly big sagebrush, Anderson peachbrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by moderately low precipitation and low available water capacity. This soil is rated as poorly suited to rangeland seeding, mainly because of the very low available water capacity of the surface layer. The duration and intensity of grazing should be adjusted to season of growth and to precipitation. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVs, irrigated and VIIs, nonirrigated.

510—Settlemeyer fine sandy loam, 0 to 2 percent slopes. This very deep, poorly drained soil is on flood plains and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,700 to 5,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is dark gray or black fine sandy loam about 15 inches thick. The upper 24 inches of the underlying material is grayish brown silty clay loam. The lower part to a depth of 60 inches is greenish gray, stratified very gravelly loamy fine sand and fine sandy loam.

Included in this unit are Dressler soils on higher parts of alluvial fans and terraces, Voltaire soils on flood plains and in shallow depressions, and Holbrook soils near upper parts of drainageways. The unit is about 5 percent Dressler soils, 5 percent Voltaire soils, and 5 percent Holbrook soils.

Permeability of this Settlemeyer soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 24 to 36 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. The seasonal high water table is at a depth of 20 to 40 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. It is slightly saline and alkali-affected.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

The high water table and flooding are limitations to use of this unit as sites for dwellings. Lowering the water table through drainage improves suitability for use as sites for dwellings. This soil is subject to seasonal flooding that can only be controlled by major flood-control structures. The main limitations to use of this unit as septic tank absorption fields are the high water table and moderately slow permeability. The absorption field should be designed to avoid raising the water table and polluting the water supplies. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and the susceptibility of this soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to strengthen the base.

The present vegetation in most areas is mainly grass. Under a good management system, this soil will produce yields of 1 ton per acre of improved meadow hay or 3 animal-unit-months per acre of pasture. If this unit is used for hay and pasture, the main limitations are the high water table and the content of salts and alkali. The high water table limits the leaching of salts from the surface layer. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for hay and pasture. Shallow-rooted, water-tolerant plants are suited to this soil. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alkali.

This soil is in capability subclasses IIIw, irrigated and VIw, nonirrigated.

513—Settlemeyer-Notus complex. This map unit is on flood plains. Elevation is 4,500 to 5,000 feet. The

average annual precipitation is about 8 to 12 inches, the average annual air temperature is 45 to 49 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 45 percent Settlemeyer fine sandy loam, 0 to 2 percent slopes, and 40 percent Notus stony loamy fine sand, 0 to 2 percent slopes. The Settlemeyer soil is on flood plains, and the Notus soil is on flood plains near the channels. Areas of these soils are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Dressler soils on lower parts of alluvial fans, Voltaire soils in swales on flood plains, Holbrook soils near the upper part of drainageways, and Oest soils on higher parts of alluvial fans. The unit is about 4 percent Dressler soils, 4 percent Voltaire soils, 4 percent Holbrook soils, and 3 percent Oest soils.

The Settlemeyer soil is very deep and poorly drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is dark gray or black fine sandy loam about 15 inches thick. The upper 24 inches of the underlying material is grayish brown silty clay loam. The lower part to a depth of 60 inches is greenish gray, stratified gravelly loamy fine sand and fine sandy loam.

Permeability of the Settlemeyer soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 24 to 36 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 20 to 40 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. This soil is slightly saline and alkali-affected.

The Notus soil is very deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is light brownish gray stony loamy fine sand about 12 inches thick. The underlying material to a depth of 60 inches is light brownish gray and light yellowish brown stratified very gravelly coarse sand through sandy loam.

Permeability of the Notus soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 48 to 60 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 48 to 60 inches in late winter and spring. This soil is subject to occasional flooding for brief periods during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and pasture.

The main limitations to use of this unit as sites for dwellings are flooding and the high water table. This soil is subject to seasonal flooding that can only be controlled by major flood control structures. These structures are difficult to establish and maintain. Lowering the water table through drainage improves suitability for use as sites for dwellings.

The main limitations to use of this unit as septic tank absorption fields are the high water table, moderately slow permeability, and flooding. Absorption fields should be designed to avoid raising the existing water table and polluting water supplies. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field.

The main limitations to use of this unit as sites for roads are the low load-bearing strength, susceptibility of the soil to frost heaving, and flooding. Roads should be provided with drainage. Suitable material should be added to strengthen the base.

The present vegetation in most areas is mainly grass. Under a good management system, these soils will produce yields of 3 animal-unit-months of pasture. If this unit is used for hay and pasture, the main limitations are the high water table and the content of salts and alkali. The high water table limits the leaching of salts from the surface layer. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for hay and pasture. Shallow-rooted, water-tolerant plants are suited to these soils. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alakali.

These soils are in capability subclasses IIIw, irrigated and VIw, nonirrigated.

514—Settlemeyer gravelly loam, 2 to 4 percent slopes. This very deep, poorly drained soil is on flood plains and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,700 to 5,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is dark gray gravelly loam about 12 inches thick. The upper 23 inches of the underlying material is grayish brown silty clay loam. The lower part to a depth of 60 inches is greenish gray, stratified gravelly loamy sand and loam.

Included in this unit are Dressler soils on lower parts of alluvial fans, Voltaire soils in swales on low flood plains, Notus soils near lower drainageways, and Holbrook soils near upper parts of drainageways and on alluvial fans. The unit is about 4 percent Dressler soils, 4 percent Voltaire soils, 4 percent Notus soils, and 3 percent Holbrook soils.

Permeability of this Settlemeyer soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 12 to 36 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 12 to 30 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. The soil is slightly saline and alkali-affected.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

Flooding and the high water table are limitations to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can only be controlled by major flood control structures. Lowering the water table through drainage improves the suitability of the soil as sites for dwellings.

The main limitations to use of this unit as septic tank absorption fields are the high water table and moderately slow permeability. Absorption fields should be designed to avoid raising the existing water table and polluting the water supplies. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and the susceptibility of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide a stable base.

The present vegetation is mainly grass and sedges. Under a good management system, this soil will produce yields of 1 ton per acre of improved meadow hay or 3 animal unit months per acre of pasture. If this unit is used for hay and pasture, the main limitations are the high water table and the content of salts and alkali. The high water table limits the leaching of salts from the surface layer. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for hay and pasture. Shallow-rooted, water-tolerant plants are suited to this soil. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations and to improve forage production. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alkali.

This soil is in capability subclasses IIIw, irrigated and VIw, nonirrigated.

520—Dressler loamy sand, 2 to 4 percent slopes. This very deep, somewhat poorly drained soil is on alluvial fans and flood plains. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 4,700 to 5,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 49 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is grayish brown loamy sand about 19 inches thick. The underlying material to a depth of 60 inches is pale brown gravelly fine sandy loam and gravelly loamy sand.

Included in this unit are Settlemeyer soils on lower parts of flood plains, Notus soils along drainageways, and wet areas that occur as seeps. The unit is about 6 percent Settlemeyer soils, 5 percent Notus soils, and 4 percent wet areas that occur as seeps.

Permeability of this Dressler soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 30 to 40 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 30 to 40 inches late in winter and early in spring. This soil is subject to flooding during storms of prolonged high intensity.

This unit is used for urban development, crops, pasture, and hayland.

Flooding is a limitation to use of this soil as sites for dwellings. This soil is subject to seasonal flooding during prolonged storms of high intensity. Structures for protection from flooding are difficult to establish and maintain. The main limitation to use of the soil as septic tank absorption fields is the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to the use of the soil as sites for roads is the susceptibility of the soil to frost heaving. Suitable base material and an adequate wearing surface are needed. Drainage should be provided.

The present vegetation in most areas is mainly grass. If this unit is used for pasture, the main limitation is the high water table. Under a good pasture or hayland management system, yields of 3 tons per acre of alfalfa, or 7.5 animal-unit-months per acre of pasture can be expected. Irrigation water must be carefully applied to avoid raising the water table. Shallow-rooted, water-tolerant plants are suited to this soil.

If this unit is used for irrigated crops, the main limitation is the high water table. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid overirrigating and leaching plant nutrients.

This soil is in capability subclasses IIIw, irrigated and VIIw, nonirrigated.

530—Sagouspe sand. This very deep, somewhat poorly drained soil is on flood plains and low terraces. It formed in sandy alluvium derived dominantly from mixed rock sources. Slopes are 0 to 2 percent. Elevation is

4,400 to 4,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is dark grayish brown sand about 21 inches thick. The underlying material to a depth of 60 inches is stratified, dark grayish brown and brown coarse sand and silt loam.

Included in this unit are Ophir soils on lower parts of alluvial fans, Cradlebaugh soils in swales and old slough bottoms, and Vamp soils on low terrace remnants. The unit is 5 percent Ophir soils, 5 percent Cradlebaugh soils, and 5 percent Vamp soils.

Permeability of this Sagouspe soil is rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 36 to 60 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. A seasonal high water table is at a depth of 36 to 40 inches in late winter and spring. This soil is subject to brief periods of flash flooding during storms of unusually high intensity.

This unit is used for urban development and pasture.

Flooding is a limitation to use of the soil as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of the soil as septic tank absorption fields are the high water table and the rapid permeability. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid this pollution hazard. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

Flooding and susceptibility to frost heaving are moderate limitations to the use of the soil as a site for roads. Suitable base material and an adequate wearing surface are needed. Drainage should be provided.

The present vegetation in most areas is grass. If this unit is used for pasture, the main limitation is the high water table. Under a good pasture management system, yields of 5 animal-unit-months per acre of pasture can be expected. Irrigation water must be carefully applied to avoid raising the water table.

This soil is in capability subclasses IVw, irrigated and VIIw, nonirrigated.

531—Sagouspe fine sandy loam. This very deep, somewhat poorly drained soil is on flood plains and low terraces. It formed in sandy alluvium dominantly from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,400 to 4,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is dark grayish brown fine sandy loam about 21 inches thick. The underlying material to a depth of 60 inches is stratified dark grayish brown and brown coarse sand and silt loam.

Included in this map unit are Ophir soils on lower parts of alluvial fans, Cradlebaugh soils on swales and old slough bottoms, and Vamp soils on low terrace remnants. The unit is about 5 percent Ophir soils, 5 percent Cradlebaugh soils, and 5 percent Vamp soils.

Permeability of this Sagouspe soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 36 to 60 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 36 to 40 inches in late winter and spring. This soil is subject to brief periods of flash flooding during storms of unusually high intensity. It is slightly saline and alkali-affected.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this soil as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitations to use of the soil as septic tank absorption fields are a high water table and the rapid permeability. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

Flooding and susceptibility to frost heaving are moderate limitations to the use of the soil as sites for roads. An adequate wearing surface is needed. Drainage should be provided.

The present vegetation in most areas of this soil is mainly grass. Under a good management system, this soil will produce yields of 6 animal-unit-months per acre of pasture. Shallow-rooted, water-tolerant plants are suited to this soil. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for hay and pasture. The high water table limits the leaching of salts from the surface layer. Lowering the water table through artificial drainage helps reduce salt and alkali concentrations and to improve forage production. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid

raising the water table and increasing the concentration of salts and alkali in the surface layer.

This soil is in capability subclasses IIIw, irrigated and VIw, nonirrigated.

532—Sagouspe gravelly sand, gravelly substratum. This very deep, somewhat poorly drained soil is on flood plains. It formed in sandy alluvium derived dominantly from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,400 to 4,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is dark grayish brown gravelly sand about 10 inches thick. The upper 30 inches of the underlying material is stratified, dark grayish brown coarse sand and silt loam. The lower part to a depth of 60 inches is dark grayish brown very gravelly loamy coarse sand.

Included in this unit are Dithod soils, which are strongly affected by salts and alkali and occur on alluvial fans; Riverwash along the channel near drainageways; and Truckee soils on lower terraces. The unit is about 5 percent Dithod soils, 5 percent Riverwash, and 5 percent Truckee soils. The percentage varies from one area to another.

Permeability of this Sagouspe soil is rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 36 to 60 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 30 to 40 inches in late winter and spring. This soil is subject to occasional flooding in late winter and spring.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

Flooding is a severe limitation to use of this soil as sites for dwellings. This soil is subject to seasonal flooding that can only be controlled by major flood control structures. The main limitations to use of the soil as septic tank absorption fields are flooding, the high water table, and the rapidly permeable underlying material. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. Dikes and channels that have outlets to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

Flooding is the main limitation to the use of this soil as a site for roads. Drainage should be provided.

The present vegetation in most areas is grass. If this unit is used for pasture, the main limitation is the high water table. Under a good pasture management system, yields of 5 animal-unit-months per acre of pasture can be expected. Irrigation water must be carefully applied to avoid raising the water table. Shallow-rooted, water-tolerant plants are suited to this soil.

This soil is in capability subclasses IVw, irrigated and VIIw, nonirrigated.

550—Leviathan stony sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on terraces. It formed in fluvial sediments and alluvium from mixed rock sources. Elevation is 4,800 to 6,000 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown stony loam about 9 inches thick. The subsoil to a depth of 60 inches is brown very gravelly sandy clay loam.

Included in this map unit are Springmeyer soils on lower terraces, Oest soils on higher alluvial fans, Verdico soils on remnants of lower terraces, and Washoe soils near drainageways. The unit is 5 percent Springmeyer soils, 5 percent Oest soils, 3 percent Verdico soils, and 2 percent Washoe soils.

Permeability of this Leviathan soil 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If the unit is used for urban development, high clay content is a moderate limitation for dwellings. High clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented if foundations and footings are properly designed and the soil is kept dry by diverting water away from the buildings. The main limitation to use of the soil as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

High clay content and susceptibility to frost heaving are moderate limitations to the use of the soil as a site for roads. An adequate wearing surface is needed. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, Anderson peachbrush, and cheatgrass. The production of forage is limited by moderately low precipitation and the moderate available water capacity of the soil. The soil is rated as poorly suited to rangeland seeding because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more

desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVs, irrigated and VIIs, nonirrigated.

551—Leviathan stony sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on terraces. It formed in fluvial sediments and alluvium from mixed rock sources. Elevation is 4,800 to 6,000 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown stony sandy loam about 9 inches thick. The subsoil to a depth of 60 inches is brown very gravelly sandy clay loam.

Included in this map unit are Springmeyer soils on lower terraces, Oest soils on alluvial fan skirts, Reno soils on higher pediment remnants, and Washoe soils near drainageways. The unit is about 5 percent Springmeyer soils, 5 percent Oest soils, 3 percent Reno soils, and 2 percent Washoe soils.

Permeability of this Leviathan soil is moderately slow. Available water capacity of the soil 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 slight.

This unit is used for urban development and rangeland.

If this unit is used for urban development, high clay content is a moderate limitation for dwellings. High clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented if foundations and footings are properly designed and the soil is kept dry by diverting water away from the buildings. The main limitation to use of the soil as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to the use of the soil as a site for roads. An adequate wearing surface is needed. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, Anderson peachbrush, and cheatgrass. The production of forage is limited by moderately low precipitation and the moderate available water capacity of the soil. The soil is rated as poorly suited to rangeland seeding because of the low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

553—Leviathan stony sandy loam, 15 to 30 percent slopes. This very deep, well drained soil is on side slopes of terraces. It formed in alluvium from mixed rock sources. Elevation is 4,800 to 6,000 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown stony sandy loam about 9 inches thick. The subsoil to a depth of 60 inches is brown very gravelly sandy clay loam.

Included in this map unit are Oest soils on alluvial fan skirts, Reno soils on higher pediment remnants, and Stodick soils on steeper side slopes of pediments. The unit is about 5 percent Oest soils, 5 percent Reno soils, and 5 percent Stodick soils.

Permeability of this Leviathan soil is moderately slow. Available water capacity of the soil 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 urban development and as rangeland.

If this unit is used for urban development, the main limitation for dwellings is the steepness of slope. The main limitation to use of the soil as septic tank absorption fields is the moderately slowly permeable subsoil and the steepness of slope. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. The absorption field should be designed to prevent surfacing of the leachate downslope.

The main limitation to use of the unit as sites for roads is steepness of slope. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, Anderson peachbrush, and bottlebrush squirreltail. The production of forage is limited by moderately low precipitation and the moderate available water capacity of the soil. The soil is rated as poorly suited to rangeland seeding because of the low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush encourages the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

554—Leviathan very stony sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on terraces. It formed in fluvial sediments and alluvium from mixed rock sources. Elevation is 4,800 to 6,000 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown very stony sandy loam about 11 inches thick. The subsoil to a

depth of 60 inches is brown very gravelly sandy clay loam.

Included in this unit are Reno soils on higher terrace remnants, Waspo soils on uplands over bedrock, and Chalco soils on higher pediment remnants. The unit is about 5 percent Reno soils, 5 percent Waspo soils, and 5 percent Chalco soils.

Permeability of this Leviathan soil 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, high clay content is a moderate limitation for dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented if foundations and footings are properly designed and the soil is kept dry by diverting water away from the buildings. The main limitation to use of the soil as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to the use of the soil as a site for roads. An adequate wearing surface is needed. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by moderately low precipitation and the moderate available water capacity of the soil. The rating is poor for rangeland seeding because of the low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

557—Leviathan very stony sandy loam, 30 to 50 percent slopes. This very deep, well drained soil is on side slopes of terraces. It formed in fluvial sediments and alluvium from mixed rock sources. Elevation is 4,800 to 6,000 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown very stony sandy loam about 11 inches thick. The subsoil to a depth of 60 inches is brown very gravelly sandy clay loam.

Included in this unit are Reno soils on higher terrace remnants, Waspo soils on uplands over bedrock, and Chalco soils on higher pediment remnants. The unit is about 5 percent Reno soils, 5 percent Waspo soils, and 5 percent Chalco soils.

Permeability of this Leviathan soil is moderately slow. Available water capacity of the soil is moderate. Effective rooting depth is 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 for urban development and as rangeland.

If this unit is used for urban development, the main limitation for the construction of dwellings is the steepness of slope. The main limitations for use of the soil as septic tank absorption fields are the moderately slowly permeable subsoil and the steepness of slope. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. The absorption field should be designed to prevent surfacing of the leachate downslope.

The main limitation to use of the unit as sites for roads is steepness of slope. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, Anderson peachbrush, and cheatgrass. The production of forage is limited by moderately low precipitation and the moderate available water capacity of the soil. The soil is rated as poorly suited for rangeland seeding because of steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

559—Leviathan extremely stony sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium from mixed rock sources. Elevation is 4,800 to 6,000 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown extremely stony sandy loam about 11 inches thick. The subsoil to a depth of 60 inches is brown very gravelly sandy clay loam.

Included in this map unit are Oest soils on higher alluvial fan skirts, Indian Creek soils on pediment remnants, and Holbrook soils near drainageways. The unit is about 5 percent Oest soils, 5 percent Indian Creek soils, and 5 percent Holbrook soils.

Permeability of this Leviathan soil 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, high clay content is a moderate limitation for dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented if foundations and footings are properly designed and the soil is kept dry by diverting water away from the buildings. The main limitation to use of the soil as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to the use of the soil as sites for roads. An adequate wearing surface is needed. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by moderately low precipitation and moderate available water capacity. The soil is rated as poorly suited to rangeland seeding, mainly because of large stones on the surface. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush encourages the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

570—Turria loam. This very deep, well drained soil is on alluvial fans. It formed in alluvium from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 5,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is light brownish gray loam about 2 inches thick. The subsoil is brown clay loam 10 inches thick. The substratum to a depth of 60 inches is pale brown, stratified sandy loam and silt loam.

Included in this map unit are Jowec soils on terrace remnants, Aladshi soils on higher alluvial fan skirts, and Mellor soils on lower terrace remnants adjacent to drainageways. The unit is about 5 percent Jowec soils, 5 percent Aladshi soils, and 5 percent Mellor soils.

Permeability of this Turria 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 slight. This soil is subject to shallow flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to the use of the soil as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitations for use of the soil as septic tank absorption fields are flooding and the moderately slowly permeable subsoil. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. Structures for protection of this soil from flash floods are difficult to establish and maintain.

The main limitations to the use of the soil as sites for roads are low strength, susceptibility to frost heaving, and flooding. Suitable base material and an adequate wearing surface are needed. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, littleleaf horsebrush, and Indian ricegrass. The production of forage is limited by low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIc, irrigated and VIc, nonirrigated.

585—Barnard-Trosi association. This map unit is on dissected alluvial fans and on terraces. Elevation is 4,600 to 5,200 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 80 to 100 days.

This unit is 50 percent Barnard stony sandy loam, 2 to 4 percent slopes, and 35 percent Trosi very stony sandy loam, 4 to 8 percent slopes. Barnard and Trosi soils are on similar landscape positions. The Barnard soil has a hardpan at a depth of 20 to 30 inches and supports big sagebrush. The Trosi soil has a hardpan at a depth of 12 to 20 inches and supports low sagebrush.

Included in this map unit are Bieber soil on lower terraces, Galeppi soils adjacent to drainageways on the side slopes, Indian Creek soils on nearly level alluvial fan tops, Oest soils on alluvial fan skirts, and wet areas near seeps. The unit is about 4 percent Bieber soils, 4 percent Galeppi soils, 3 percent Indian Creek soils, 2 percent Oest soils, and 2 percent wet areas.

The Barnard soil is moderately deep and well drained. It formed in alluvium and pedisediments from mixed rock sources. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony sandy loam about 15 inches thick. The subsoil is light yellowish brown clay about 11 inches thick. The upper part of the substratum is an indurated, silica-cemented hardpan. The depth to the hardpan ranges

from 20 to 30 inches. Below the hardpan is gravelly and cobbly alluvium.

Permeability of the Barnard soil is slow. Available water capacity is low. Effective rooting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Trosi soil is shallow and well drained. It formed in alluvium from mixed rock sources. Typically, 3 to 15 percent of the surface is covered with stones and some cobbles. The surface layer is light brown very stony sandy loam about 12 inches thick. The subsoil is brown very cobbly clay about 7 inches thick. The upper 15 inches of the substratum is an indurated hardpan. The depth to the hardpan ranges from 12 to 20 inches. Below the hardpan is very gravelly and very cobbly alluvium interbedded with layers of finer material.

Permeability of the Trosi soil is very slow. Available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The unit is used for urban development and as rangeland.

If the unit is used for urban development, the main limitations to the use of the unit as sites for buildings are the high shrink-swell potential of the Barnard soil and stoniness and the hardpan. Structural damage can be prevented if foundations and footings are properly designed and the soil is kept dry by diverting water away from the buildings. Heavy equipment is needed to excavate the large stones and to cut through the hardpan. The main limitations to use of this unit as septic tank absorption fields are the hardpan and the very slowly permeable subsoil of the Trosi soil and the hardpan of the Barnard soil. In some areas, percolation can be improved by placing the leach line below the hardpan.

The main limitations to use of this unit as sites for roads are low strength of the soil and high clay content of the Barnard soil and the hardpan of the Trosi soil. Suitable base material and an adequate wearing surface are needed. Deep cuts should be avoided because of the underlying hardpan.

The present vegetation in most areas of the Barnard soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout the area. The production of forage is limited by moderately low precipitation, low available water capacity, and the restricted depth of the root zone over the hardpan. The suitability of this soil for rangeland seeding is poor, mainly because of the moderately low precipitation.

The present vegetation on the Trosi soils in most areas is mainly low sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by very low available water capacity and the restricted depth of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor because of the very low available water capacity of the surface layer and the restricted depth of the root zone over the hardpan.

Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The Barnard soil is in capability subclass VIs, nonirrigated. The Trosi soil is in capability subclass VIIs, nonirrigated.

590—Springmeyer stony loam, 0 to 2 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,800 to 5,500 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is grayish brown stony loam about 13 inches thick. The subsoil is brown gravelly sandy clay loam about 27 inches thick. The substratum to a depth of 60 inches is stratified very gravelly sandy clay loam to loamy sand.

Included in this map unit are Orr soils on lower terraces, Leviathan soils on higher terrace remnants, Holbrook soils near drainageways, and wet soils near seeps. The unit is about 5 percent Orr soils, 5 percent Leviathan soils, 3 percent Holbrook soils, and 2 percent wet soils.

Permeability of this Springmeyer 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 slight.

This unit is used for urban development, crops, pasture, and hayland.

If the unit is used for urban development, high clay content is a moderate limitation for dwellings. High clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented if foundations and footings are properly designed and the soil is kept dry by diverting water away from the buildings. The main limitation to use of the soil as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to the use of this soil as a site for roads. Suitable base material and an adequate wearing surface are needed. Drainage should be provided.

The present vegetation in most areas is mainly grasses. If this unit is used for hay and pasture, the main limitation is stones. Under a good pasture management system, yields of 6 animal-unit-months per acre of pasture can be expected.

This soil is in capability subclasses IVs, irrigated and VIs, nonirrigated.

591—Springmeyer stony loam, 2 to 4 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,800 to 5,500 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is grayish brown stony loam about 13 inches thick. The subsoil is brown gravelly sandy clay loam about 27 inches thick. The substratum to a depth of 60 inches is stratified very gravelly sandy clay loam and loamy sand.

Included in this map unit are Orr soils on lower terraces, Leviathan soils on higher terrace remnants, Holbrook soils near drainageways, and wet soils near seeps. The unit is about 5 percent Orr soils, 5 percent Leviathan soils, 3 percent Holbrook soils, and 2 percent wet areas.

Permeability of this Springmeyer 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 slight.

This unit is used for urban development, pasture, and hayland.

If the unit is used for urban development, high clay content is a moderate limitation for dwellings. High clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented if foundations and footings are properly designed and the soil is kept dry by diverting water away from the buildings. The main limitation to use of the soil as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to the use of the soil as sites for roads. An adequate wearing surface is needed. Drainage should be provided.

If this unit is used for hay and pasture, the main limitations are stones and slope. The present vegetation in most areas is mainly grasses. Under a good pasture management system, yields of 6 animal-unit-months per acre of pasture can be expected.

This soil is in capability subclasses IVs, irrigated and VIs, nonirrigated.

595—Springmeyer sandy clay loam, 0 to 2 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,800 to 5,500 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is brown sandy clay loam about 13 inches thick. The subsoil is pale brown gravelly sandy clay loam about 27 inches thick. The substratum to a depth of 60 inches is stratified very gravelly sandy clay loam to loamy sand.

Included in this map unit are Oest soils on higher alluvial fans, Holbrook soils near drainageways, and wet areas near seeps. The unit is about 4 percent Oest soils, 4 percent Holbrook soils, and 2 percent wet areas.

Permeability of this Springmeyer 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 slight.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

If the unit is used for urban development, high clay content is a moderate limitation for dwellings. High clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented if foundations and footings are properly designed and the soil is kept dry by diverting water away from the buildings. The main limitation to use of the soil as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to the use of the soil as a site for roads. An adequate wearing surface is needed. Drainage should be provided.

If this unit is used for hay and pasture, the main limitation is the length of the growing season. Under a good management system, yields of 6 animal-unit-months per acre of pasture can be expected.

This soil is in capability subclass IIc, irrigated and VIc, nonirrigated.

600—Idlewild clay loam, drained. This very deep, somewhat poorly drained soil is on alluvial fans and terraces. The drainage has been altered. This soil formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,300 to 4,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is very dark grayish brown clay loam about 13 inches thick. The subsoil is olive brown silty clay and silty clay loam about 23 inches thick. The substratum is olive brown stratified sandy clay loam and silty clay loam about 26 inches thick.

Included in this unit are Fleischmann soils on slightly higher terrace remnants, Orr soils on alluvial fan skirts, and Truckee soils on lower flood plains and in swales.

The unit is about 5 percent Fleischmann soils, 5 percent Orr soils, and 5 percent Truckee soils.

Permeability of this Idlewild 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 slight.

This unit is used for urban development. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the main limitation to construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. Percolation can also be improved in some areas by placing the leach line below the least permeable layer.

The main limitations to use of this soil as sites for roads are low load-bearing strength, high clay content, and susceptibility of this soil to frost heaving. Suitable material should be added to provide a stable base and an adequate wearing surface. Drainage should be provided.

This soil is in capability subclass, IIw, irrigated and VIw, nonirrigated.

601—Idlewild sandy loam, drained. This very deep soil is on alluvial fans and terraces. The drainage has been altered. This soil formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,300 to 4,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is very dark grayish brown sandy loam about 13 inches thick. The subsoil is olive brown silty clay about 23 inches thick. The substratum is olive brown, stratified sandy clay loam and silty clay loam 26 inches thick.

Included in this unit are Fleischmann soils on slightly higher terrace remnants, Orr soils on alluvial fan skirts, and Truckee soils on flood plains and in swales. The unit is about 5 percent Fleischmann soils, 5 percent Orr soils, and 5 percent Truckee soils.

Permeability of this Idlewild 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 slight.

This unit is used for urban development. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the main limitation to construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the slowly permeable subsoil. The limitation can be overcome by increasing the size of the absorption field. Percolation can also be improved in some areas by placing the leach line below the least permeable layer.

The main limitations to use of this unit as sites for roads are low load-bearing strength, high clay content, and susceptibility to frost heaving. Roads should be provided with a stable base, an adequate wearing surface, and drainage.

This soil is in capability subclass IIw, irrigated.

602—Idlewild gravelly sandy loam. This very deep, somewhat poorly drained soil is on low-lying terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,300 to 4,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 35 percent of the surface is covered with gravel. The surface layer is very dark grayish brown gravelly sandy loam about 10 inches thick. The subsoil is olive brown silty clay about 26 inches thick. The substratum to a depth of 60 inches or more is olive brown, stratified sandy clay loam and clay loam.

Included in this unit are Dressler soils on lower alluvial fans, Settlemeyer soils in bottoms of swales, Vamp soils on terrace remnants, and Fleischmann soils on higher terrace remnants. The unit is about 4 percent Dressler soils, 4 percent Settlemeyer soils, 4 percent Vamp soils, and 3 percent Fleischmann soils.

Permeability of this Idlewild soil is slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 30 to 60 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. The seasonal high water table is at a depth of 30 to 60 inches. This soil is subject to flooding during storms of prolonged high intensity.

This unit is used for urban development and pasture and as hayland. It can be used for irrigated crops if water is available.

Flooding and high clay content are limitations to use of this unit as sites for dwellings. The high shrink-swell potential of this soil can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. Flash floods can occur on this soil during storms of high intensity. Structures for protection from such floods are difficult to establish and maintain.

The main limitations to use of this soil as septic tank absorption fields are the high water table and the slowly

permeable subsoil. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. The limitation imposed by slow permeability can be overcome by increasing the size of the absorption field. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitations to use of this unit as sites for roads are low load-bearing strength, high clay content, and the susceptibility of the soil to frost heaving. If roads are constructed across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface. Drainage should be provided.

If this unit is used for hay and pasture, the main limitation is the high water table. The vegetation is mainly grass. Shallow-rooted, water-tolerant plants are suited to this soil. Irrigation water must be carefully applied to avoid raising the water table.

This soil is in capability subclasses IIIw, irrigated and VIw, nonirrigated.

612—Verdico very stony sandy loam, 4 to 8 percent slopes. This moderately deep, well drained soil is on pediments and strath terraces. It formed in pedisediment and fluvial sediment. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown very stony sandy loam about 2 inches thick. The subsoil is light yellowish brown clay about 20 inches thick. The substratum is light yellowish brown gravelly clay. Weathered tuff is at a depth of 29 inches. Depth to weathered bedrock is 20 to 40 inches.

Included in this unit are Reno soils on higher terraces, Northmore soils on lower alluvial fans, and Galeppi soils near the ends of alluvial terraces. The unit is about 5 percent Reno soils, 5 percent Northmore soils, and 5 percent Galeppi soils.

Permeability of this Verdico soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this unit as septic tank absorption fields are restricted depth over bedrock and the very slowly permeable subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for construction of roads are low load-bearing strength and high clay content. If roads are constructed across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas of this soil is mainly low sagebrush and Douglas rabbitbrush. The production of forage is limited by moderately low precipitation, the restricted depth of the root zone over bedrock, high clay content, and low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

613—Verdico extremely stony sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on pediments and strath terraces. It formed in pedisediment and fluvial sediment. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown extremely stony sandy loam about 2 inches thick. The subsoil is light yellowish brown clay about 20 inches thick. The substratum is light yellowish brown gravelly clay. Weathered tuff is at a depth of 29 inches. Depth to weathered bedrock is 20 to 40 inches.

Included in this unit are Reno soils on higher terraces, Northmore soils on lower alluvial fans, and Galeppi soils near the ends of terraces. The unit is about 5 percent Reno soils, 5 percent Northmore soils, and 5 percent Galeppi soils.

Permeability of this Verdico soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be

prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this soil as septic tank absorption fields are the restricted depth to bedrock and the very slowly permeable subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for construction of roads are low load-bearing strength and high clay content. If roads are constructed across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas of this soil is mainly low sagebrush and Douglas rabbitbrush. The production of forage is limited by moderately low precipitation, high clay content, the restricted depth of the root zone over bedrock, and the low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

614—Verdico extremely stony sandy loam, 15 to 30 percent slopes. This moderately deep, well drained soil is on pediments and strath terraces. It formed in pedisediment and fluvial sediment. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown extremely stony sandy loam about 2 inches thick. The subsoil is light yellowish brown clay about 20 inches thick. The substratum is light yellowish brown gravelly clay. Weathered tuff is at a depth of 29 inches. Depth to weathered bedrock is 20 to 40 inches.

Included in this unit are Reno soils on higher terrace remnants, Northmore soils on lower alluvial fans, and Galeppi soils near the ends of alluvial terraces. The unit is about 5 percent Reno soils, 5 percent Northmore soils, and 5 percent Galeppi soils.

Permeability of this Verdico soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for construction of dwellings are the steepness of slope and the high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this soil as septic tank absorption fields are the restricted depth to bedrock, the very slowly permeable subsoil, and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this soil as sites for roads are low load-bearing strength, steepness of slope, and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas of this soil is mainly low sagebrush and Douglas rabbitbrush. The production of forage is limited by moderately low precipitation, high clay content, the restricted depth of the root zone over bedrock, and the low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

615—Verdico sandy loam, 4 to 8 percent slopes. This moderately deep, well drained soil is on pediments and strath terraces. It formed in pedisediment and fluvial sediment. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown sandy loam about 2 inches thick. The subsoil is light yellowish brown clay about 20 inches thick. The substratum is light yellowish brown gravelly clay. Weathered tuff is at a depth of 29 inches. Depth to weathered bedrock is 20 to 40 inches.

Included in this unit are Reno soils on higher terrace remnants, Northmore soils on lower alluvial fans, and Galeppi soils near the ends of terraces. The unit is about 5 percent Reno soils, 5 percent Northmore soils, and 5 percent Galeppi soils.

Permeability of this Verdico soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this soil as septic tank absorption fields are the restricted depth to bedrock and the very slowly permeable subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are low load-bearing strength and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas of this soil is mainly low sagebrush. The production of forage is limited by moderately low precipitation, high clay content, the restricted depth of the root zone over bedrock, and the low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

620—Orr stony sandy loam, 2 to 4 percent slopes. This very deep, well drained soil is on terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,800 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 0.1 to 1 percent of the surface is covered with stones. The surface layer is brown stony sandy loam about 10 inches thick. The subsoil is light yellowish brown gravelly sandy clay loam about 40 inches thick. The substratum to a depth of 60 inches or more is very pale brown gravelly sandy loam.

Included in this unit are Oest soils on higher alluvial fan collars, Springmeyer soils on terrace remnants, Bedell soils on inset alluvial fans, and wet areas that occur on seeps. The unit is about 4 percent Oest soils, 4 percent Springmeyer soils, 4 percent Bedell soils, and 3 percent wet areas.

Permeability of this Orr 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 slight.

This unit is used for urban development and as rangeland and pasture. It can be used for irrigated crops if water is available.

If this unit is used for urban development, high clay content is a moderate limitation to use as sites for construction of dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to use of this unit as sites for roads. Suitable material should be added to provide an adequate wearing surface. Drainage should be provided.

The present vegetation in most areas of this soil is mainly big sagebrush and grass. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is fair. The main limitation for seeding is moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

If this unit is used for pasture, the main limitations are stones and slope. The present vegetation in most areas is mainly grasses. Under a good pasture management system, this soil will produce yields of 6 animal-unit-months per acre of pasture.

This soil is in capability subclasses IIIs, irrigated, and VIc, nonirrigated.

621—Orr stony sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,800 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 0.1 to 1 percent of the surface is covered with stones. The surface layer is brown stony sandy loam about 10 inches thick. The subsoil is light yellowish brown gravelly sandy clay loam about 40 inches thick.

The substratum to a depth of 60 inches or more is very pale brown gravelly sandy loam.

Included in this unit are Oest soils on higher alluvial fan collars, Springmeyer soils on terrace remnants, Bedell soils on inset alluvial fans, and wet areas that occur as seeps. The unit is about 4 percent Oest soils, 4 percent Springmeyer soils, 4 percent Bedell soils, and 3 percent wet areas. Also included west of Verdi is a soil that is similar to Orr soil but receives more precipitation and is moist for longer periods of time.

Permeability of this Orr 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, a moderate limitation to use as sites for construction of dwellings is high clay content, which results in moderately high shrink-swell potential. The moderately high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas of this soil is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. The production of forage is limited by moderately low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is moderately low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVs, irrigated and VIs, nonirrigated.

622—Orr stony sandy loam, gravelly substratum, 2 to 4 percent slopes. This very deep, well drained soil is on terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,800 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is brown stony sandy loam about 12 inches thick. The subsoil is pale brown gravelly sandy clay loam about 38 inches thick. The substratum to a depth of 60 inches or more is stratified very gravelly sand, gravelly loamy sand, and gravelly sandy loam.

Included in this map unit are Oest soils on higher alluvial fan collars, Springmeyer soils on terrace remnants, Bedell soils on inset alluvial fans, and wet areas that occur as seeps. This unit is 4 percent Oest soils, 4 percent Springmeyer soils, 4 percent Bedell soils, and 3 percent wet areas. Also included west of Verdi is a small area of soils that are similar to Orr soils except that they receive more precipitation, are moist for longer periods of time, and support Jeffrey pine.

Permeability of this Orr soil is moderately slow in the subsoil and rapid in the substratum. 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 slight.

This unit is used for urban development, rangeland, and pasture.

If the unit is used for urban development, high clay content is a moderate limitation for the construction of dwellings. High clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented if foundations and footings are properly designed and the soil is kept dry by diverting water away from the buildings. The main limitations to use of the soil as septic tank absorption fields are the moderately slowly permeable subsoil and the rapidly prmeable substratum. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. Absorption fields should be designed so that the leach lines are not placed into the rapidly permeable layers. The leachate can move through the rapidly permeable material and into the ground water or into nearby surface water before it is sufficiently purified.

Susceptibility to frost heaving and high clay content are moderate limitations to the use of the soil as sites for roads. If roads are built across areas of this soil, suitable material should be added to provide an adequate wearing surface. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is fair. The main limitation for seeding is moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush encourages the growth of desirable forage grasses.

If this unit is used for hay and pasture, the main limitation is stones. The present vegetation is mainly

grass. Under a good management system, yields of 6 animal-unit-months per acre of pasture can be expected.

This soil is in capability subclasses IVs, irrigated and VIs, nonirrigated.

623—Orr sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on river terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,800 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is brown sandy loam about 10 inches thick. The subsoil is light yellowish brown gravelly sandy clay loam about 40 inches thick. The substratum to a depth of 60 inches or more is very pale brown gravelly sandy loam.

Included in this unit are Fleischmann soils on terrace remnants; Oest soils on higher alluvial fan collars; and Truckee soils, which are saline and alkali-affected and are on flood plains and in swales. The unit is about 5 percent Fleischmann soils, 5 percent Oest soils, and 5 percent Truckee soils.

Permeability of this Orr 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 slight.

This unit is used for urban development and irrigated crops.

If this unit is used for urban development, a moderate limitation to construction of dwellings is high clay content. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

If this unit is used for irrigated crops, the main limitation is the length of the growing season. Under good management including a conservation cropping system, this soil will produce yields of 4.5 tons per acre of alfalfa, 46 bushels per acre of barley, or 60 bushels per acre of oats. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

This soil is in capability subclasses IIc, irrigated and VIc, nonirrigated.

624—Orr gravelly sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on river terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,800 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is brown gravelly sandy loam about 12 inches thick. The subsoil is light yellowish brown gravelly sandy clay loam about 38 inches thick. The substratum to a depth of 60 inches or more is very pale brown gravelly sandy loam.

Included in this unit are Fleischmann soils on terrace remnants; Oest soils on higher alluvial fan collars; and Truckee soils, which are saline and alkali-affected and are on flood plains and in swales. The unit is about 5 percent Fleischmann soils, 5 percent Oest soils, and 5 percent Truckee soils.

Permeability of this Orr 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 unit is used for urban development and irrigated crops.

If this unit is used for urban development, a moderate limitation to construction of dwellings is high clay content. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to use of this unit as sites for roads. Roads should be provided with an adequate wearing surface and drainage.

If this unit is used for irrigated crops, the main limitation is the length of the growing season. Under good management including a conservation cropping system, this soil will produce yields of 4.5 tons per acre of alfalfa, 46 bushels per acre of barley, or 60 bushels per acre of oats. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

This soil is in capability subclasses IIc, irrigated and VIc, nonirrigated.

630—Fleischmann gravelly clay loam, 2 to 4 percent slopes. This moderately deep, well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,300 to 5,200 feet. The

average annual precipitation is about 8 to 12 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly clay loam about 4 inches thick. The upper 6 inches of the subsoil is brown heavy clay loam, and the lower 10 inches is yellowish brown clay. The upper 23 inches of the substratum is a hardpan. The lower part to a depth of 60 inches is variable, compact, stratified alluvial material. Depth to the hardpan ranges from 20 to 30 inches.

Included in this unit are Orr soils on alluvial fans, Reno soils on higher terrace remnants, and Idlewild soils on lower terraces in swales. The unit is about 5 percent Orr soils, 5 percent Reno soils, and 5 percent Idlewild soils.

Permeability of this Fleischmann soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and pasture. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the hardpan. In some areas, percolation can be improved by placing the leach line below the hardpan.

The main limitations to use of this unit as sites for roads are low load-bearing strength and high clay content. If roads are built across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface.

If this unit is used for hay and pasture, the main limitations are the moderate depth of the root zone and the very low available water capacity. The present vegetation is mainly grass. Under a good pasture management system, this soil will produce yields of 5 animal-unit-months per acre of pasture. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop so that a perched water table is not created above the hardpan. A close-growing plant cover is needed to reduce the erosion hazard if steeper slopes are irrigated.

This soil is in capability subclasses IIIe, irrigated and VIIs, nonirrigated.

631—Fleischmann gravelly clay loam, 4 to 8 percent slopes. This moderately deep, well drained soil is on terraces. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 4,300 to 5,200 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly clay loam about 4 inches thick. The upper 6 inches of the subsoil is brown heavy clay loam, and the lower 10 inches is yellowish brown clay. The upper 23 inches of the substratum is a hardpan. The lower part to a depth of 60 inches is variable, compact, stratified alluvial material. Depth to the hardpan ranges from 20 to 30 inches.

Included in this unit are Orr soils on alluvial fans, Reno soils on terrace remnants, and Idlewild soils on low terraces in swales. The unit is about 5 percent Orr soils, 5 percent Reno soils, and 5 percent Idlewild soils.

Permeability of this Fleischmann soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and pasture.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the hardpan. In some areas, percolation can be improved by placing the leach line below the hardpan.

The main limitations to use of this unit as sites for roads are low load-bearing strength and high clay content. If roads are constructed across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface.

If this unit is used for pasture, the main limitations are the moderate depth of the root zone and the very low available water capacity. The present vegetation is mainly grass. Under a good pasture management system, this soil will produce yields of 4 animal-unit-months per acre of pasture. An irrigation water management system should be used that does not perch a water table on the hardpan. A close-growing plant cover is needed to reduce the erosion hazard if steeper slopes are irrigated.

This soil is in capability subclasses IVe, irrigated and VIIs, nonirrigated.

632—Fleischmann loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on terraces. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 4,300 to 5,200 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown loam about 4 inches thick. The upper 6 inches of the subsoil is brown heavy clay loam, and the lower 10 inches is yellowish brown clay. The upper 23 inches of the substratum is a hardpan. The lower part to a depth of 60 inches is variable, compact, stratified alluvial material. Depth to the hardpan ranges from 20 to 30 inches.

Included in this unit are Reywat soils on small upland remnants, Galeppi soils on alluvial fans, Orr soils on inset alluvial fans, and wet areas that occur as seeps. The unit is about 4 percent Reywat soils, 4 percent Galeppi soils, 4 percent Orr soils, and 3 percent wet areas.

Permeability of this Fleischmann soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the hardpan. In some areas, percolation can be improved by placing the leach line below the hardpan.

The main limitations to use of this unit as sites for roads are low load-bearing strength and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface.

This soil is not assigned a capability classification.

640—Notus stony loamy fine sand. This very deep soil is on alluvial flood plains. Drainage has been altered. This soil formed in alluvium from mixed rock sources. Slopes are 0 to 4 percent. Elevation is 4,300 to 4,500 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is about 110 days.

Typically, about 1 percent of the surface is covered with stones. The surface layer is light brownish gray stony loamy fine sand about 12 inches thick. The underlying material to a depth of 60 inches is stratified extremely gravelly coarse sand to sandy loam.

Included in this unit are Rose Creek soils on lower flood plains, Holbrook soils near the upper parts of drainageways, and Settlemeyer soils on lower parts of alluvial fans near wet seeps. The unit is about 5 percent Rose Creek soils, 5 percent Holbrook soils, and 5 percent Settlemeyer soils.

Permeability of this Notus soil is moderately 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 slight. A seasonal high water table is at a depth of 48 to 60 inches in late winter and spring. This soil is subject to occasional flooding during storms of prolonged high intensity in late winter and spring. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for construction of dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. Flooding is a limitation to use of the soil as septic tank absorption fields.

Flooding is a limitation to use of this unit as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, rubber rabbitbrush, and grass. The production of forage is limited by the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

This soil is in capability subclass VIIs, nonirrigated.

650—Chalco very stony clay loam, 15 to 30 percent slopes. This shallow, well drained soil is on side slopes of pediment remnants. It formed in residuum derived dominantly from lacustrine sedimentary rock. Elevation is 4,900 to 5,400 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is light brownish gray very stony clay loam about 3 inches thick. The subsoil is dark yellowish brown clay about 12 inches thick. Weathered lacustrine sedimentary rock is at a depth of 15 inches. Depth to weathered sedimentary rock ranges from 10 to 20 inches.

Included in this unit are Stodick soils on convex slopes, Reno soils on higher pediment remnants, and Badland on eroded areas. The unit is about 5 percent Stodick soils, 5 percent Reno soils, and 5 percent Badland.

Permeability of this Chalco soil is very 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 slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for construction of dwellings are the steepness of slope and high clay content. The

high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this soil as septic tank absorption fields are the restricted depth to bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Designs that increase the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are low load-bearing strength, steepness of slope, and high clay content. If roads are constructed across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the restricted depth of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor because of the restricted depth of the root zone over bedrock and the very low available water capacity. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

651—Chalco very stony clay loam, 30 to 50 percent slopes. This shallow, well drained soil is on slopes of pediment remnants. It formed in residuum derived dominantly from lacustrine sedimentary rock. Elevation is 4,900 to 5,400 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is light brownish gray very stony clay loam about 4 inches thick. The subsoil is dark yellowish brown clay about 11 inches thick. Weathered lacustrine sedimentary rock is at a depth of 15 inches. Depth to weathered sedimentary rock ranges from 10 to 20 inches.

Included in this unit are Badland on eroded areas and Stodick soils on higher convex slopes. The unit is about 8 percent Badland and 7 percent Stodick soils.

Permeability of this Chalco soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for construction of dwellings are the steepness of slope and the high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this unit as septic tank absorption fields are the restricted depth to bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Designs that increase the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are low load-bearing strength, steepness of slope, and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush and bottlebrush squirreltail. The production of forage is limited by the restricted depth of the root zone over bedrock and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope, the very low available water capacity, and the restricted depth of the root zone over bedrock. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

652—Chalco stony loam, 4 to 8 percent slopes. This shallow, well drained soil is on pediment remnants. It formed in residuum derived dominantly from lacustrine sedimentary rock. Elevation is 4,900 to 5,400 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is light brownish gray stony loam 3 inches thick. The subsoil is dark yellowish brown clay about 12 inches thick. Weathered lacustrine sedimentary rock is at a depth of 15 inches. Depth to

weathered sedimentary rock ranges from 10 to 20 inches.

Included in this unit are Reno soils on the pediment remnants, Badland on eroded areas, Waspo soils in areas of localized alluvium, and Galeppi soils on the back slopes of the pediments. The unit is about 5 percent Reno soils, 5 percent Badland, 3 percent Waspo soils, and 2 percent Galeppi soils.

Permeability of this Chalco soil is very 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is the high clay content of this soil. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitation to use of this unit as septic tank absorption fields is the shallowness of this soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize this limitation. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are low load-bearing strength and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the shallowness of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the shallowness of the root zone over bedrock and the very low available water capacity. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

653—Chalco cobbly sandy loam, 8 to 15 percent slopes. This shallow, well drained soil is on pediment remnants. It formed in residuum derived dominantly from lacustrine sedimentary rock. Elevation is 4,900 to 5,400 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 15 to 25 percent of the surface is covered with cobbles. The surface layer is light brownish gray cobbly sandy loam about 3 inches thick. The subsoil is dark yellowish brown clay about 12 inches thick. Weathered lacustrine sedimentary rock is at a depth of 15 inches. Depth to weathered sedimentary rock ranges from 10 to 20 inches.

Included in this unit are Reno soils on the pediment remnants, Badland on eroded areas, Waspo soils in areas of localized alluvium, and Galeppi soils on the back slopes of the pediments. The unit is about 5 percent Reno soils, 5 percent Badland, 3 percent Waspo soils, and 2 percent Galeppi soils.

Permeability of this Chalco soil is very 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 slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for dwellings is the high clay content. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitation to use of this unit as septic tank absorption fields is the shallowness of this soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize this limitation. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content. If roads are constructed across areas of this soil, suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the shallowness of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the shallowness of the root zone over bedrock and the very low available water capacity. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

654—Chalco-Celeton Variant complex, 2 to 8 percent slopes. This map unit is on terraces and pediment remnants. Elevation is 4,900 to 5,400 feet. The

average annual precipitation is about 8 to 10 inches, the average annual air temperature is 47 to 49 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 45 percent Chalco cobbly sandy loam, 4 to 8 percent slopes, and 40 percent Celeton Variant very gravelly loam, 2 to 8 percent slopes. The Chalco soil is on top of pediment remnants. The Celeton Variant is on terraces. Areas of these soils are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Badland on eroded areas, Aquinas soils on higher alluvial fans and terraces, and Wedertz soils on inset alluvial fans. The unit is about 6 percent Badland, 5 percent Aquinas soils, and 4 percent Wedertz soils.

The Chalco soil is shallow and well drained. It formed in residuum derived dominantly from lacustrine sedimentary rock. Typically, 15 to 25 percent of the surface is covered with cobbles. The surface layer is light brownish gray cobbly sandy loam about 3 inches thick. The subsoil is dark yellowish brown clay about 12 inches thick. Weathered lacustrine sedimentary rock is at a depth of 15 inches. Depth to weathered sedimentary rock ranges from 10 to 20 inches.

Permeability of the Chalco soil is very 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 slight. The hazard of soil blowing is slight.

The Celeton Variant soil is very shallow and somewhat excessively drained. It formed in residuum derived dominantly from lacustrine sedimentary rock. Typically, 40 to 50 percent of the surface is covered with gravel. The surface layer is light gray very gravelly loam about 6 inches deep over highly weathered lacustrine sedimentary rock. Depth to weathered sedimentary rock ranges from 5 to 15 inches.

Permeability of the Celeton Variant soil is rapid. Available water capacity is very low. Effective rooting depth is 5 to 15 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for construction of dwellings are the high clay content of the Chalco soil and the shallowness over bedrock of the Celeton Variant soil. High clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. Heavy equipment is needed to cut into the bedrock.

The main limitation to use as septic tank absorption fields is shallowness over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this Chalco soil as sites for roads are low load-bearing strength and high clay content. Susceptibility to frost heaving and depth to bedrock are moderate limitations on the Celeton Variant soil. Suitable material should be added to provide a stable base and an adequate wearing surface. Drainage should be provided. Deep cuts should be avoided because of the underlying bedrock.

The present vegetation in most areas is mainly Douglas rabbitbrush, spiny hopsage, and bottlebrush squirreltail. The production of forage is limited by the shallowness of the root zone over bedrock and very low available water capacity. The suitability of these soils for rangeland seeding is very poor, mainly because of the shallowness of the root zone over bedrock and the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

These soils are in capability subclass VIIs, nonirrigated.

660—Oest very bouldery sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 3 to 10 percent of the surface is covered with boulders. The surface layer is grayish brown very bouldery sandy loam about 13 inches thick. The subsoil is brown very gravelly sandy loam about 31 inches thick. The substratum is pale brown very gravelly loamy sand that extends to 60 inches.

Included in this unit are Leviathan soils on alluvial fan remnants, Orr soils on lower terraces, Apmat soils in an area west of Verdi and at higher elevations, and Notus soils near drainageways. The unit is about 5 percent Leviathan soils, 5 percent Orr soils, 3 percent Apmat soils, and 2 percent Notus soils.

Permeability of this Oest soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Effective rooting depth is more than 60 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, a moderate limitation to use as sites for construction of dwellings is

stones. Heavy equipment is needed to excavate the large stones. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Susceptibility to frost heaving and stones are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage and an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the large stones on the surface. Grazing should be delayed until the soil is firm and the more desirable plants have sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

661—Oest bouldery sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, about 1 percent of the surface is covered with boulders. The surface layer is grayish brown bouldery sandy loam about 14 inches thick. The subsoil is brown very gravelly sandy loam about 26 inches thick. The substratum is pale brown very gravelly loamy sand that extends to 60 inches.

Included in this unit are Leviathan soils on alluvial fan remnants, Orr soils on lower terraces, Apmat soils west and southwest of Verdi and at higher elevations, and Notus soils near drainageways. The unit is about 5 percent Leviathan soils, 5 percent Orr soils, 3 percent Apmat soils, and 2 percent Notus soils.

Permeability of this Oest soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Effective rooting depth is more than 60 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated pasture if water is available.

If this unit is used for urban development, a moderate limitation to use as sites for construction of dwellings is stones. Heavy equipment is needed to excavate the large stones. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

The susceptibility of this soil to frost heaving and stones are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage and an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by the moderately low precipitation. The suitability of this soil for rangeland seeding is fair. The main limitations for seeding are the moderately low precipitation and the large stones on the surface. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVs, irrigated, and VIIs, nonirrigated.

662—Oest extremely stony sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 50 percent of the surface is covered with stones. The surface layer is grayish brown extremely stony sandy loam about 8 inches thick. The subsoil is brown very gravelly sandy loam about 32 inches thick. The substratum is pale brown very gravelly loamy sand that extends to 60 inches.

Included in this unit are Leviathan soils on alluvial fan remnants, Orr soils on lower terraces, Apmat soils at higher elevations, and Notus soils near drainageways. The unit is about 5 percent Leviathan soils, 5 percent Orr soils, 3 percent Apmat soils, and 2 percent Notus soils.

Permeability of this Oest soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Effective rooting depth is more than 60 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, a moderate limitation to use as sites for dwellings is stones. Heavy equipment is needed to excavate the large stones. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

The susceptibility of this soil to frost heaving and stones are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage and an adequate wearing surface.

The present vegetation in most areas of this soil is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by the moderately low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the large stones on the surface. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

663—Oest very gravelly loam, 15 to 30 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 35 to 60 percent of the surface is covered with gravel. The surface layer is grayish brown very gravelly loam about 15 inches thick. The subsoil is brown very gravelly sandy loam about 25 inches thick. The substratum is pale brown very gravelly loamy sand that extends to 60 inches.

Included in this unit are Leviathan soils on the lower part of alluvial fans, Orr soils on lower terraces, Settlemeyer soils near seeps, and Notus soils near drainageways. The unit is about 5 percent Leviathan soils, 5 percent Orr soils, 3 percent Settlemeyer soils, and 2 percent Notus soils.

Permeability of this Oest soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Effective rooting depth is more than 60 inches. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the rapidly permeable substratum and the steepness of slope. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. Care should be taken to prevent surfacing of the leachate downslope.

The main limitation to use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is poor because of steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

664—Oest very gravelly loam, 8 to 15 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is grayish brown very gravelly loam about 14 inches thick. The subsoil is brown very gravelly sandy loam about 26 inches thick. The substratum is pale brown very gravelly loamy sand that extends to 60 inches.

Included in this unit are Leviathan soils on the lower part of alluvial fans, Orr soils on lower terraces, Apmat soils at higher elevations, and Notus soils near drainageways. The unit is about 5 percent Leviathan soils, 5 percent Orr soils, 3 percent Apmat soils, and 2 percent Notus soils.

Permeability of this Oest soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Effective rooting depth is more than 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, a moderate limitation to use as sites for construction of dwellings is the steepness of slope. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Steepness of slope and susceptibility to frost heaving are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage and an adequate wearing surface. They should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas of this soil is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by the moderately low precipitation. The suitability of this soil for

rangeland seeding is fair. The main limitation for seeding is moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

668—Oest very bouldery sandy loam, 30 to 50 percent slopes. This very deep, well drained soil is on side slopes of alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 3 to 15 percent of the surface is covered with boulders. The surface layer is grayish brown very bouldery sandy loam about 15 inches thick. The subsoil is brown very gravelly sandy loam about 25 inches thick. The substratum is pale brown very gravelly loamy sand that extends to 60 inches.

Included in this unit are Leviathan soils on the lower part of alluvial fans, Orr soils on lower terraces, Apmat soils west and southwest of Verdi and at higher elevations, and Notus soils near drainageways. The unit is about 5 percent Leviathan soils, 5 percent Orr soils, 3 percent Apmat soils, and 2 percent Notus soils.

Permeability of this Oest soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Effective rooting depth is more than 60 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the rapidly permeable substratum and the steepness of slope. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. Care should be taken to prevent surfacing of the leachate downslope.

The main limitation to use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

669—Oest gravelly sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 35 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly sandy loam about 14 inches thick. The subsoil is brown very gravelly sandy loam about 26 inches thick. The substratum is pale brown very gravelly loamy sand that extends to 60 inches.

Included in this unit are Leviathan soils on alluvial fan remnants, Orr soils on lower terraces, and Holbrook soils near drainageways. The unit is about 5 percent Leviathan soils, 5 percent Orr soils, and 5 percent Holbrook soils.

Permeability of this Oest soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Effective rooting depth is more than 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigrated crops if water is available.

If this unit is used for urban development, this soil is well suited to use as sites for dwellings. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

The susceptibility of this soil to frost heaving is a moderate limitation to use of this unit as sites for roads. Roads should be provided with drainage and an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by the moderately low precipitation. The suitability of this soil for rangeland seeding is fair. The main limitation for seeding is the moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated.

670—Galeppi sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on dissected alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is 80 to 90 days.

Typically, the surface layer is brown sandy loam about 10 inches thick. The subsoil is brown sandy clay loam about 12 inches thick. The substratum is weakly silica-cemented sandy loam to a depth of 60 inches.

Included in this unit are Oest soils on higher alluvial fan skirts, Barnard soils on tops of higher terrace remnants, Stodick soils on small upland remnants, and Reno soils in shallow depressions. Also included west of Verdi is a small area of soil that is similar to Galeppi soil but receives more precipitation and is moist for longer periods of time. The unit is about 5 percent Oest soils, 5 percent Barnard soils, 3 percent Stodick soils, and 2 percent Reno soils.

Permeability of this Galeppi soil is moderately slow. Available water capacity of the soil is moderate. Effective rooting depth is about 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the high clay content is a moderate limitation to use as sites for construction of dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

Susceptibility to frost heaving and high clay content are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIIe, irrigated, and VIs, nonirrigated.

671—Galeppi sandy loam, 8 to 15 percent slopes. This very deep, well drained soil is on dissected alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is 80 to 90 days.

Typically, the surface layer is brown sandy loam about 10 inches thick. The subsoil is brown sandy clay loam about 14 inches thick. The substratum is weakly silica-cemented sandy loam to a depth of 60 inches.

Included in this unit are Oest soils on higher alluvial fan skirts, Barnard soils on tops of higher terrace remnants, Stodick soils on small upland remnants, and Reno soils in shallow depressions on remnants. The unit is about 5 percent Oest soils, 5 percent Barnard soils, 3 percent Stodick soils, and 2 percent Reno soils.

Permeability of this Galeppi soil is moderately slow. Available water capacity of the soil is moderate. Effective rooting depth is about 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the high clay content and the steepness of slope are moderate limitations to use as sites for construction of dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. In some areas, percolation can also be improved by placing the leach line below the least permeable layer.

Steepness of slope, susceptibility to frost heaving, and high clay content are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVe, irrigated, and VIs, nonirrigated.

673—Galeppi sandy loam, 15 to 30 percent slopes. This very deep, well drained soil is on dissected alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is 80 to 90 days.

Typically, the surface layer is brown sandy loam about 10 inches thick. The subsoil is brown sandy clay loam about 11 inches thick. The substratum is weakly silica-cemented sandy loam to a depth of 60 inches.

Included in this unit are Oest soils on higher alluvial fan skirts, Barnard soils on higher terrace remnants, Stodick soils on small upland remnants, and Verdico soils in shallow depressions. The unit is about 5 percent Oest soils, 5 percent Barnard soils, 3 percent Stodick soils, and 2 percent Verdico soils.

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

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is the steepness of slope. The moderately high shrink-swell potential of this soil can cause structural damage. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitations to use of this unit as septic tank absorption fields are the moderately slowly permeable subsoil and the steepness of slope. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. In some areas, percolation can also be improved by placing the leach line below the least permeable layer. Absorption fields should be designed to prevent surfacing of the leachate downslope.

The main limitation to use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because the available water capacity of the surface layer is very low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIe, nonirrigated.

674—Galeppi stony sandy loam, 8 to 15 percent slopes. This very deep, well drained soil is on dissected alluvial fans and terraces. It formed in alluvium from mixed rock sources. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is 80 to 90 days.

Typically, 1 to 3 percent of the surface is covered with stones, some cobbles, and some pebbles. The surface layer is brown stony sandy loam about 10 inches thick. The subsoil is brown cobbly sandy clay loam about 11 inches thick. The substratum is weakly silica-cemented sandy loam to a depth of 60 inches.

Included in this unit are Oest soils on higher alluvial fan skirts, Barnard soils on tops of terrace remnants, Stodick soils on small upland remnants, and Verdico soils in shallow depressions. The unit is about 5 percent Oest soils, 5 percent Barnard soils, 3 percent Stodick soils, and 2 percent Verdico soils.

Permeability of this Galeppi soil is moderately slow. Available water capacity of the soil is moderate. Effective rooting depth is about 60 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the high clay content, stones, and the steepness of slope are moderate limitations for use as sites for dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. Heavy equipment is needed to excavate the large stones. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. In some areas, percolation can also be improved by placing the leach line below the least permeable layer.

Steepness of slope, the susceptibility of the soil to frost heaving, and low load-bearing strength are moderate limitations to use of the unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide a stable base. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because the available water capacity of the surface layer is very low. Grazing should be delayed until the soil is firm and the more desirable

plants have achieved sufficient growth to withstand grazing pressure. Clearing brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIs, nonirrigated.

676—Galeppi-Barnard association. This map unit is on dissected alluvial fans and terraces. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 80 to 100 days.

This unit is 55 percent Galeppi stony sandy loam, 4 to 15 percent slopes, and 30 percent Barnard stony sandy loam, 2 to 8 percent slopes. The Galeppi soil is on the side slopes and near the toe slopes of the alluvial terraces. The Barnard soil is on remnant tops of the alluvial fans.

Included in this unit are Trosi soils on slightly higher alluvial fan remnant tops, Leviathan soils on higher alluvial fan skirts, and Cassiro soils adjacent to drainageways. The unit is about 5 percent Trosi soils, 5 percent Leviathan soils, and 5 percent Cassiro soils.

The Galeppi soil is very deep and well drained. It formed in alluvium from mixed rock sources. Typically, 1 to 3 percent of the surface is covered with stones, some cobbles, and some pebbles. The surface layer is brown stony sandy loam about 9 inches thick. The subsoil is brown sandy clay loam about 27 inches thick. The substratum is weakly silica-cemented sandy loam to a depth of 60 inches.

Permeability of the Galeppi soil is moderately slow. Available water capacity of the soil is moderate. Effective rooting depth is about 60 inches. Runoff is slow to medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Barnard soil is moderately deep and well drained. It formed in alluvium and pedisediment from mixed rock sources. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony sandy loam about 15 inches thick. The subsoil is light yellowish brown clay about 11 inches thick. The substratum is a silica-cemented hardpan over gravelly and cobbly alluvium. Depth to the thick hardpan ranges from 20 to 30 inches.

Permeability of the Barnard soil is slow. Available water capacity is low. Effective rooting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Galeppi soil is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. A small amount of juniper is dispersed throughout. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is poor because the available water capacity of the surface layer is very low.

The present vegetation in most areas of the Barnard soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by moderately low precipitation, low available water capacity, and the restricted depth of the root zone over the hardpan. The suitability of this soil for rangeland seeding is poor, mainly because of the large stones on the surface.

Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

The main limitations to use of this unit as sites for roads are low load-bearing strength, steepness of slope, high clay content, and susceptibility to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface and a stable base. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIs, nonirrigated.

681—Reno very stony fine sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on pediments and river terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,800 to 5,300 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 50 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 5 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony fine sandy loam about 2 inches thick. The subsoil is pale brown and light yellowish brown clay about 22 inches thick. The substratum is a strongly silica-cemented hardpan about 23 inches thick over weakly consolidated sediment. Depth to the hardpan ranges from 20 to 40 inches.

Included in this unit are Barnard soils along the upper edge of the unit, Leviathan soils on the lower edge of the terraces, and Northmore soils on lower alluvial fans and north-facing side slopes. The unit is about 4 percent Barnard soils, 6 percent Leviathan soils, and 5 percent Northmore soils.

Permeability of this Reno soil is very slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is slow to medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for dwellings is the high clay content. The high clay content results in high shrink-swell potential, which can cause structural damage to

buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the hardpan. In some areas, percolation can be improved by placing the leach line below the hardpan.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by the moderately low precipitation, the restricted depth of the root zone over the hardpan, high clay content, and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

683—Reno stony sandy loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on pediments and river terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,800 to 5,300 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 50 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony sandy loam about 4 inches thick. The subsoil is pale brown and light yellowish brown clay about 20 inches thick. The substratum is a strongly silica-cemented hardpan about 23 inches thick over weakly consolidated sediment. Depth to the hardpan ranges from 20 to 40 inches.

Included in this unit are Barnard soils along the upper edge of the unit, Leviathan soils near the lower edge of the terraces, and Northmore soils on inset alluvial fans. The unit is about 5 percent Barnard soils, 5 percent Leviathan soils, and 5 percent Northmore soils.

Permeability of this Reno soil is very slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for dwellings is high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the hardpan. In some areas, percolation can be improved by placing the leach line below the hardpan.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content. Material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush, antelope bitterbrush, and cheatgrass. The production of forage is limited by the moderately low precipitation, restricted depth of the root zone over the hardpan, high clay content, and very low available water capacity. The suitability of this soil for rangeland seeding is poor. The main limitations for seeding are the very low available water capacity, the abrupt textural boundary, the restricted depth of the root zone over the hardpan, and large stones on the surface. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

730—Stodick very stony loam, 15 to 30 percent slopes. This shallow, well drained soil is on back slopes and side slopes of pediments. It formed in residuum and alluvium derived dominantly from lacustrine sedimentary rocks. Elevation is 4,800 to 5,300 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 95 to 110 days.

Typically, 3 to 5 percent of the surface is covered with stones. The surface layer is light brownish gray very stony loam about 4 inches thick. The subsoil is light yellowish brown very gravelly clay loam about 10 inches thick. Interbedded tuff, mudstone, and sandstone are at a depth of 14 inches. Depth to sedimentary bedrock ranges from 14 to 20 inches.

Included in this unit are Chalco soils on the less sloping areas, Galeppi soils near the ends of the higher terraces, Rock outcrop, Verdico soils in slightly concave areas, and severely eroded areas mostly along the California State line. The unit is about 5 percent Chalco soils, 5 percent Galeppi soils, 1 percent Rock outcrop, 3 percent Verdico soils, and 1 percent severely eroded areas.

Permeability of this Stodick soil is moderately slow. Available water capacity is very low. Effective rooting depth is 14 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 urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for construction of dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the shallowness of the soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit

conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this unit as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the shallowness of the root zone. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

731—Stodick stony loam, 30 to 50 percent slopes. This shallow, well drained soil is on back slopes and side slopes of pediments. It formed in residuum and alluvium derived dominantly from lacustrine sedimentary rocks. Elevation is 4,800 to 5,300 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 95 to 110 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is pale brown stony loam about 5 inches thick. The subsoil is light yellowish brown very gravelly clay loam about 9 inches thick. Interbedded tuff, mudstone, and sandstone are at a depth of 14 inches. Depth to sedimentary bedrock ranges from 14 to 20 inches.

Included in this unit are Chalco soils on the tops of the pediments, Galeppi soils near the edge of higher terraces, Rock outcrop, Verdico soils on slightly concave slopes of the pediments, and severely eroded areas mostly along the California state line. The unit is about 4 percent Chalco soils, 5 percent Galeppi soils, 1 percent Rock outcrop, 3 percent Verdico soils, and 2 percent severely eroded areas.

Permeability of this Stodick soil is moderately slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If the unit is used for urban development, the main limitation to use as sites for construction of dwellings is the steepness of slope. The main limitations to use of the unit as septic tank absorption fields are the shallowness of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of the soil as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor. The main limitations for seeding are steepness of slope, the very low available water capacity, and the shallowness of the root zone over bedrock. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

740—Blackwell sandy loam. This very deep, poorly drained soil is on low terraces and flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 4 percent. Elevation is 6,000 to 9,000 feet. The average annual precipitation is about 25 inches, the average annual air temperature is 39 to 41 degrees F, and the average frost-free period is 30 to 50 days.

Typically, the surface layer is grayish brown sandy loam about 11 inches thick. The underlying material to a depth of 60 inches or more is mottled, stratified gravelly coarse sand through clay loam.

Included in this unit are Inville Variant soils on higher terrace remnants near drainageways, Marla soils on alluvial fans, Macareeno soils on higher colluvial fans, and wet muck or peat spots adjacent to seeps. The unit is about 5 percent Inville Variant soils, 4 percent Marla soils, 4 percent Macareeno soils, and 2 percent wet muck or peat spots.

Permeability of this Blackwell soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 6 to 30 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 6 to 30 inches in winter to midsummer. This soil is subject to occasional flooding during periods of rapid snowmelt.

This soil is used for unimproved pasture and range.

The present vegetation in most areas of this soil is mainly willows and sedges. The potential plant community is mainly willows and sedges. The production of forage is limited by the shortness of the frost-free period. Cold soil temperature delays plant growth and readiness for grazing. Grazing should be delayed until the soils are warm and the plants have achieved sufficient growth. The suitability of this soil for rangeland seeding is very poor, mainly because the frost-free period is only 30 to 50 days.

If this unit is used for unimproved pasture, the main limitations are the shortness of the frost-free period and the high water table. The rate of application of irrigation water should be regulated to avoid raising the water table. Grazing when the soil is wet compacts the surface layer and causes poor tilth and excessive runoff. Wetness and cold temperatures limit the choice of plants and the period of cutting or grazing and increase the risk of winterkill.

The main limitations to use of this soil as sites for roads are flooding, susceptibility to frost heaving, and the high water table. Roads should be provided with drainage.

This soil is in capability subclass VIw, nonirrigated.

752—Toiyabe-Corbett-Rock outcrop association, moderately steep. This map unit is on mountainous uplands. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 42 to 44 degrees F, and the average frost-free period is 60 to 80 days.

This unit is 40 percent Toiyabe bouldery coarse sand, 15 to 30 percent slopes; 35 percent Corbett bouldery sand, 15 to 30 percent slopes; and 15 percent Rock outcrop. The Toiyabe soil is near ridges; the Corbett soil is on lower, slightly concave slopes; and the Rock outcrop is on tops and ridges.

Included in this unit are Temo soils on high ridges, Witefels soils on higher north-facing slopes, Graufels soils on lower south-facing slopes, and wet seep areas along drainageways. The unit is about 3 percent Temo soils, 3 percent Witefels soils, 3 percent Graufels soils, and 1 percent wet areas.

The Toiyabe soil is shallow and excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery coarse sand about 8 inches thick. The underlying material is pale brown gravelly coarse sand about 5 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 10 to 20 inches.

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

The Corbett soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery sand about 8 inches thick. The underlying material is pale brown gravelly loamy coarse sand about 24 inches thick over weathered bedrock. Depth to bedrock ranges from 24 to 40 inches.

Permeability of the Corbett soil is rapid. Available water capacity is very low. Effective rooting depth is 24 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop is mainly granodiorite.

This unit is used as woodland.

The present vegetation in most areas of the Toiyabe soil is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and squawcarpet. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The present vegetation in most areas of the Corbett soil is mainly Jeffrey pine with an understory of antelope bitterbrush, snowbrush ceanothus, and manzanita. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 3,100 cubic feet, or 13,100 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The sandy texture imposes some limitations on the use of equipment and creates a hazard of erosion. Management that minimizes the risk of erosion is essential when harvesting timber. Stones on the surface and the presence of Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

The main limitation to use of this soil as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Corbett soil is in capability subclass VIIs, nonirrigated. The Toiyabe soil is in capability subclass VIIe, nonirrigated.

753—Toiyabe-Corbett-Rock outcrop association, steep. This map unit is on mountainous uplands. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 42 to 44 degrees F, and the average frost-free period is 60 to 80 days.

This unit is 55 percent Toiyabe bouldery coarse sand, 30 to 50 percent slopes; 20 percent Corbett bouldery sand, 30 to 50 percent slopes; and 15 percent Rock outcrop. The Toiyabe soil is near ridges; the Corbett soil is on lower, slightly concave slopes; and the Rock outcrop is on tops and ridges.

Included in this unit are Temo soils on high ridges, Witefels soils on higher north-facing slopes, Graufels soils on lower south-facing slopes, and wet seep areas along drainageways. The unit is about 3 percent Temo soils, 3 percent Witefels soils, 3 percent Graufels soils, and 1 percent wet areas.

The Toiyabe soil is shallow and excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery coarse sand about 8 inches thick. The underlying material is pale brown coarse sand about 5 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 10 to 20 inches.

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

The Corbett soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery sand about 8 inches thick. The underlying material is pale brown gravelly loamy coarse sand about 24 inches thick over weathered bedrock. Depth to bedrock ranges from 24 to 40 inches.

Permeability of the Corbett soil is rapid. Available water capacity is very low. Effective rooting depth is 24 to 40 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop consists of rounded granodiorite.

This unit is used as woodland.

The present vegetation in most areas of the Toiyabe soil is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and squawcarpet. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The present vegetation in most areas of the Corbett soil is mainly Jeffrey pine with an understory of antelope bitterbrush, snowbrush ceanothus, and manzanita. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 3,100 cubic feet, or 13,100 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The sandy texture of the soils imposes some limitations on the use of equipment and creates a severe hazard of erosion. The steepness of slope limits the kinds of equipment that can be used in forest management. Stones on the surface and the presence of Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

The main limitation to use of this unit as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Corbett soil is in capability subclass VIIs, nonirrigated. The Toiyabe soil is in capability subclass VIIe, nonirrigated.

754—Toiyabe-Rock outcrop complex, 50 to 70 percent slopes. This map unit is on mountainous uplands. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 42 to 44 degrees F, and the average frost-free period is 60 to 80 days.

This unit is 80 percent Toiyabe bouldery coarse sand, 50 to 70 percent slopes, and 10 percent Rock outcrop. The Toiyabe soil is on mountain side slopes, and the Rock outcrop is on small peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Corbett soils on concave slopes, Graufels soils on lower colluvial slopes, and wet seep areas along intermittent drainageways. The unit is about 6 percent Corbett soils, 2 percent Graufels soils, and 2 percent wet areas.

The Toiyabe soil is shallow and excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery coarse sand about 9 inches thick. The underlying material to a depth of 13 inches is pale brown gravelly loamy coarse sand. Weathered bedrock is at a depth of 13 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

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

Rock outcrop consists of exposed areas of granitic rocks as small peaks.

This unit is used as woodland.

The present vegetation in most areas of the Toiyabe soil is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and squawcarpet. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The sandy texture imposes some limitations on the use of equipment and creates a hazard of erosion. Stones on the surface and the presence of Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment. The steepness of slope

limits the kinds of equipment that can be used in forest management.

The main limitation to use of this soil as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

This soil is in capability subclass VIIe, nonirrigated.

756—Toiyabe-Corbett-Haypress association. This map unit is on mountainous uplands. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 20 to 35 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 60 to 80 days.

This unit is 35 percent Toiyabe bouldery coarse sand, 30 to 50 percent slopes; 30 percent Corbett bouldery sand, 15 to 30 percent slopes; and 20 percent Haypress very bouldery loamy coarse sand, 15 to 50 percent slopes. The Toiyabe soil is near ridges. The Corbett soil is on lower, slightly concave slopes. The Haypress soil is on higher, convex slopes.

Included in this unit are Temo soils near high ridges, Witefels soils on higher north-facing slopes, Graufels soils on lower south-facing slopes, granitic Rock outcrop as peaks and ridges, and wet seep areas along drainageways. The unit is about 3 percent Temo soils, 3 percent Witefels soils, 3 percent Graufels soils, 4 percent Rock outcrop, and 2 percent wet areas. Also included near the California State line are some loamy soils that contain more rock fragments.

The Toiyabe soil is shallow and excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery coarse sand about 7 inches thick. The underlying material is pale brown coarse sand about 8 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 10 to 20 inches.

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

The Corbett soil is moderately deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is dark grayish brown bouldery sand about 9 inches thick. The underlying material is pale brown gravelly loamy coarse sand about 25 inches thick over weathered bedrock. Depth to bedrock ranges from 24 to 40 inches.

Permeability of the Corbett soil is rapid. Available water capacity is very low. Effective rooting depth is 24 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Haypress soil is deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 3 to 10 percent of the surface is covered with boulders. The surface layer is dark grayish brown very bouldery loamy coarse sand about 15 inches thick. The underlying material is brown gravelly loamy coarse sand about 31 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Haypress soil is rapid. Available water capacity is very low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as woodland.

The present vegetation in most areas of the Toiyabe soil is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and squawcarpet. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The present vegetation in most areas of the Corbett soil is mainly Jeffrey pine with an understory of antelope bitterbrush, snowbrush ceanothus, and manzanita. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 3,100 cubic feet, or 13,100 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The present vegetation in most areas of the Haypress soil is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and manzanita. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 3,600 cubic feet, or 16,400 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

In all the soils in this map unit, the steepness of slope limits the kinds of equipment that can be used in forest management. The sandy texture imposes some limitations on the use of equipment and creates a hazard of erosion. Stones on the surface and the presence of Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment.

The main limitation to the use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Toiyabe soil is in capability subclass VIIe, nonirrigated. The Corbett and Haypress soils are in capability subclass VIIs, nonirrigated.

772—Booford very stony sandy loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on upland slopes. It formed in residuum of tuff. Elevation is 5,000 to 6,500 feet. The average annual precipitation is about 16 to 18 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 50 to 80 days.

Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony sandy loam about 7 inches thick. The subsoil is brown clay to a depth of 25 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Included in this unit are Yuko soils near ridges at lower elevations; Jumbo soils on colluvial, north-facing slopes at higher elevations; and Duckhill Variant soils near higher ridges and on tops. The unit is about 5 percent Yuko soils, 5 percent Jumbo soils, and 5 percent Duckhill Variant soils. Also included near the California State line are areas of soils that have slightly less clay and support conifer trees.

Permeability of this Booford soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for dwellings is the high clay content, which causes high shrink-swell potential. The high shrink-swell potential can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this unit as septic tank absorption fields are the restricted depth over bedrock and the slowly permeable subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and mountainmahogany. The production of forage is limited by the low available water capacity and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is poor, mainly because of the large stones on the surface. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

775—Booford very stony loam, 30 to 50 percent slopes. This moderately deep, well drained soil is on upland slopes. It formed in residuum of tuff. Elevation is 5,000 to 6,500 feet. The average annual precipitation is about 16 to 18 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 50 to 80 days.

Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 8 inches thick. The subsoil is brown clay to a depth of 25 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Included in this unit are Yuko soils near ridges at lower elevations; Jumbo soils on colluvial, north-facing slopes at higher elevations; and Duckhill Variant soils near higher ridges and on tops. The unit is about 5 percent Yuko soils, 5 percent Jumbo soils, and 5 percent Duckhill Variant soils.

Permeability of this Booford soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for construction of dwellings are the steepness of slope and high clay content. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this soil as septic tank absorption fields are the restricted depth over bedrock, the slowly permeable subsoil, and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this soil as sites for roads are the steepness of slope, low load-bearing strength, and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and mountainmahogany. The production of forage is limited by the low available water capacity and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor because of the steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion. Grazing should be delayed until the soil is firm

and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

780—Bieber stony sandy loam, 0 to 4 percent slopes. This shallow, well drained soil is on terraces and pediments. It formed in alluvium and pedisediment derived from mixed rock sources. Elevation is 4,900 to 5,200 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is dark grayish brown stony sandy loam about 8 inches thick. The subsoil is brown clay about 11 inches thick. The substratum to a depth of 25 inches is an indurated hardpan. Depth to the hardpan ranges from 10 to 20 inches. Below the hardpan is highly variable weathered tuff conglomerate and thin plates of duripan.

Included in this unit are Oest soils on higher lying alluvial fans, Leviathan soils on higher terraces, and Barnard soils on level or slightly concave surfaces of terraces. The unit is about 4 percent Oest soils, 4 percent Leviathan soils, and 2 percent Barnard soils.

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

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, the main limitations to use as sites for dwellings are the high clay content and the hardpan. Heavy equipment is needed to cut through the hardpan. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the hardpan. In some areas, percolation can be improved by placing the leach line below the hardpan.

The main limitations to use of this soil as sites for roads are the hardpan, low load-bearing strength, and high clay content. Deep cuts should be avoided because of the underlying hardpan. Suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor because of the very low available water capacity and the shallow root zone. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

782—Bieber stony sandy loam, 8 to 15 percent slopes. This shallow, well drained soil is on terraces and pediments. It formed in alluvium and pedisediment derived from mixed rock sources. Elevation is 4,900 to 5,200 feet. The average annual precipitation is about 10 to 14 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is dark grayish brown stony sandy loam about 7 inches thick. The subsoil is brown clay about 12 inches thick. The substratum to a depth of 25 inches or more is an indurated hardpan. Depth to the hardpan ranges from 10 to 20 inches. Weakly consolidated stratified cobbly sandy loam to very gravelly sandy loam is below the hardpan.

Included in this unit are Chalco soils on pediment remnants and Badland on eroded terrace breaks. The unit is about 8 percent Chalco soils and 7 percent Badland.

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

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for dwellings are the high clay content and the hardpan. Heavy equipment is needed to cut through the hardpan. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the hardpan. In some areas, percolation can be improved by placing the leach line below the hardpan.

The main limitations to use of this soil as sites for roads are the hardpan, low load-bearing strength, and high clay content. Deep cuts should be avoided because of the underlying hardpan. Suitable material should be added to provide a stable base and an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor because of the very low available water capacity and the shallow root zone. Grazing should be delayed until the soil is firm and the

more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

800—Truckee silt loam. This very deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. The elevation is 4,000 to 4,800 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown silt loam about 12 inches thick. The underlying material to a depth of 60 inches is light brownish gray, stratified sandy loam through silty clay loam.

Included in this unit are Rose Creek soils in stringer channels; Voltaire soils in swales and old slough bottoms; and Truckee soils, which are strongly saline-alkali and occur on lower flood plains. The unit is about 6 percent Rose Creek soils, 4 percent Voltaire soils, and 5 percent Truckee soils.

Permeability of this Truckee soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 30 to 60 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 30 to 60 inches in spring and early summer. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development, crops, pasture, and hayland.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this soil as septic tank absorption fields are the high water table and the moderately slowly permeable underlying material. The absorption field should be designed to avoid raising the water table and polluting the water supplies. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this soil as sites for roads is the susceptibility of the soil to frost heaving. Roads should be provided with drainage and an adequate wearing surface.

If this unit is used for irrigated crops, the main limitation is the high water table. Under good management including a conservation cropping system, this soil will produce yields of 4 tons per acre of alfalfa, 42 bushels per acre of barley, or 60 bushels per acre of oats. The rate of application of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

If this unit is used for hay and pasture, the main limitation is the high water table. The present vegetation is mainly grass. Under a good pasture or hayland management system, the soil will produce yields of 4 tons per acre of alfalfa or 8 animal-unit-months per acre of pasture. The rate of application of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table.

This soil is in capability subclasses IIw, irrigated, and VIw, nonirrigated.

802—Truckee silt loam, strongly saline. This very deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,000 to 4,800 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown silt loam about 12 inches thick. The underlying material to a depth of 60 inches is light brownish gray, stratified sandy loam through silty clay loam.

Included in this unit are Fettic soils on low terrace remnants; Voltaire soils in swales; and areas of Truckee slightly saline soils, which are intermixed with areas of this Truckee soil. The unit is about 4 percent Fettic soils, 6 percent Voltaire soils, and 5 percent Truckee soils.

Permeability of this Truckee soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 30 to 60 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 30 to 60 inches in spring and early summer. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. The soil is strongly saline and alkali-affected.

This unit is used for urban development and pasture. It can be used for irrigated crops if it is reclaimed and if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this unit as septic tank absorption fields are the high water table and the moderately slowly permeable underlying material. Absorption fields should be designed to avoid raising the water table and polluting the water supplies. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. If the density of housing is too high, community

sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this soil as sites for roads is the susceptibility of the soil to frost heaving. Roads should be provided with drainage and an adequate wearing surface.

The present vegetation in most areas is mainly black greasewood and grass. Under a good management system, this soil will produce yields of 5.5 animal-unit-months per acre of pasture. If this unit is used for pasture, the main limitations are the high water table and the content of salts and alkali. The high water table limits the leaching of salts from the surface layer. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for hay and pasture. Shallow-rooted, water-tolerant plants are suited to this soil. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations and to improve forage production. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alkali.

This soil is in capability subclasses IVw, irrigated, and VIIw, nonirrigated.

805—Truckee sandy loam, gravelly substratum. This very deep, somewhat poorly drained soil is on flood plains. Drainage has been altered. This soil formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,400 to 4,800 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is gray sandy loam about 12 inches thick. The upper 18 inches of the underlying material is gray, stratified sandy loam through silty clay loam. The lower part to a depth of 60 inches is pale brown, stratified gravelly sand through very gravelly sandy loam. Depth to gravelly material ranges from 30 to 40 inches.

Included in this unit are Rose Creek soils that occur as stringer channels on flood plains, Washoe soils on alluvial fan remnants, and Fettic soils on low terrace remnants. The unit is about 4 percent Rose Creek soils, 5 percent Washoe soils, and 6 percent Fettic soils.

Permeability of the Truckee soil is moderately slow in the upper part of the underlying material and rapid in the lower part. Available water capacity is moderate. Effective rooting depth is 60 inches. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. The soil is moderately saline- and alkali-affected.

This unit is used for urban development.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this unit as septic tank absorption fields are the moderately slow permeability in the upper part of the substratum and the rapid permeability in the lower part. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. The leach lines should not be placed in the rapidly permeable layer. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this soil as sites for roads is the susceptibility of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

This soil is not assigned a capability classification.

806—Truckee sandy loam, sandy substratum, strongly saline. This very deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Elevation is 4,000 to 4,800 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is gray sandy loam about 12 inches thick. The upper 18 inches of the underlying material is gray, stratified sandy loam and silty clay loam. The lower part to a depth of 60 inches is pale brown, stratified sand through very fine sandy loam. Depth to the sandy layer ranges from 30 to 40 inches.

Included in this unit are Rose Creek soils on slightly higher stringer channels, Washoe soils on low alluvial fan remnants, and Fettic soils on low terrace remnants. The unit is about 5 percent Rose Creek soils, 5 percent Washoe soils, and 5 percent Fettic soils.

Permeability of this Truckee soil is moderately slow in the upper part of the underlying material and rapid in the lower part. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 30 to 60 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 30 to 60 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. The soil is strongly saline- and alkali-affected.

This unit is used for urban development and pasture. It can be used for irrigated crops if it is reclaimed and if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that

can be controlled only by major flood control structures. The main limitations to use of this soil for septic tank absorption fields are the high water table, the moderately slow permeability in the upper part of the underlying material, and the rapid permeability in the lower part. This soil is not suited to septic tank absorption fields unless the water table is lowered by drainage. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. The leach lines should not be placed in the rapidly permeable layer. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this soil as sites for roads is the susceptibility of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly grass. Under a good management system, this soil will produce yields of 6 animal-unit-months per acre of pasture. If this unit is used for pasture, the main limitations are the high water table and the content of salts and alkali. The high water table limits the leaching of salts from the surface layer. The concentration of salts and alkali in the surface layer limits forage production and the selection of plants suitable for pasture. Shallow-rooted, water-tolerant plants are suited to this soil. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations and to improve forage production. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alkali.

This soil is in capability subclasses IVw, irrigated, and VIIw, nonirrigated.

810—Rose Creek fine sandy loam, drained. This very deep, poorly drained soil is on flood plains. Drainage has been altered. The soil formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 6 to 8 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is grayish brown fine sandy loam about 16 inches thick. The underlying material to a depth of 60 inches is light brownish gray, stratified very fine sandy loam through gravelly loamy sand.

Included in this unit are Holbrook soils on narrow stringer channels, Truckee soils on lower flood plains, and wet areas. The unit is about 6 percent Holbrook soils, 5 percent Truckee soils, and 4 percent wet areas.

Permeability of this Rose Creek soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited by the water table for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 48 to 72 inches in spring and early summer. Drainage has changed because the water table has dropped as a result of changes in the original course of streams or of channel entrenchment. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and crops.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The use of this soil as septic tank absorption fields is moderately limited by flooding and the high water table. Dikes and channels that have outlets to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this soil as sites for roads is the susceptibility of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

If this unit is used for irrigated crops, the main limitation is the high water table. Under good management including a conservation cropping system, this soil will produce 5 tons per acre of alfalfa, 73 bushels per acre of barley, or 360 hundredweight per acre of potatoes. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Crops respond to nitrogen and phosphorus fertilizer.

This soil is in capability subclasses IIw, irrigated, and VIw, nonirrigated.

812—Rose Creek loamy fine sand, drained. This very deep, poorly drained soil is on flood plains. Drainage has been altered. This soil formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 6 to 8 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is grayish brown loamy fine sand about 15 inches thick. The underlying material to a depth of 60 inches is light brownish gray stratified very fine sandy loam through gravelly loamy sand.

Included in this unit are Holbrook soils on narrow stringer channels, Truckee soils on lower flood plains, and wet areas. The unit is about 5 percent Holbrook soils, 5 percent Truckee soils, and 5 percent wet areas.

Permeability of this Rose Creek soil is moderately rapid. Available water capacity is moderate. Effective

rooting depth is 60 inches for water-tolerant plants but is limited by the water table for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 48 to 72 inches in spring and early summer. Drainage has changed because the water table has dropped as a result of changes in the original course of streams or of channel entrenchment. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and crops.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The use of this soil as septic tank absorption fields is moderately limited by flooding and the high water table. Dikes and channels that have outlets to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to the use of this soil as sites for roads is the susceptibility of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

If this unit is used for irrigated crops, the main limitation is the high water table. Under good management including a conservation cropping system, 5 tons per acre of alfalfa, 73 bushels per acre of barley, or 360 hundredweight per acre of potatoes may be expected. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

This soil is in capability subclasses IIw, irrigated, and VIw, nonirrigated.

813—Rose Creek gravelly fine sandy loam, drained. This very deep, poorly drained soil is on flood plains. Drainage has been altered. This soil formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 6 to 8 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 120 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly fine sandy loam about 16 inches thick. The underlying material to a depth of 60 inches is light brownish gray, stratified very fine sandy loam through gravelly loamy sand.

Included in this unit are Holbrook soils on narrow stringer channels, Truckee strongly saline soils on lower flood plains, and wet areas. The unit is about 6 percent Holbrook soils, 6 percent Truckee soils, and 3 percent wet areas.

Permeability of this Rose Creek soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited by the water table for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 48 to 72 inches in spring and summer. Drainage has changed because the water table has dropped as a result of changes in the original course of streams or of channel entrenchment. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and crops.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this soil as septic tank absorption fields are flooding and the high water table. Dikes and channels that have outlets to bypass floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. This soil is not suited to septic tank absorption fields unless the water table is lowered by drainage. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this soil as sites for roads is the susceptibility of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

If this unit is used for irrigated crops, the main limitation is the high water table. Under good management including a conservation cropping system, this soil will produce yields of 5 tons per acre of alfalfa, 73 bushels per acre of barley, or 360 hundredweight per acre of potatoes. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

This soil is in capability subclasses IIw, irrigated, and VIw, nonirrigated.

820—Marla loamy sand, 4 to 8 percent slopes. This very deep, poorly drained soil is on alluvial fans. It formed in alluvium derived from mixed but predominantly granitic rocks. Elevation is 6,000 to 8,000 feet. The average annual precipitation is 35 to 40 inches, the average annual air temperature is 40 to 42 degrees F, and the average frost-free period is 60 to 70 days.

Typically, the surface layer is grayish brown loamy sand about 18 inches thick. The upper part of the underlying material is light yellowish brown loamy sand about 26 inches thick. The lower part of the underlying

material to a depth of 60 inches or more is very pale brown loamy sand with strata of loam.

Included in this unit are Blackwell soils in swales and on flood plains, Inville Variant soils on terrace remnants along drainageways, and Macareeno soils on adjacent hills. This unit is about 5 percent Blackwell soils, 5 percent Inville Variant soils, and 2 percent Macareeno soils.

Permeability of this Marla soil is moderately rapid in the upper part of the underlying material and moderately slow below. Available water capacity is low. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 12 to 24 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 12 to 24 inches in spring and early summer. This soil is subject to occasional flooding for brief periods during periods of rapid snowmelt.

This unit is used as woodland.

The present vegetation in most areas is mainly lodgepole pine and Jeffrey pine with an understory of grass. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 5,200 cubic feet, or 24,500 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. This soil is wet in spring. Management operations should be conducted during drier seasons.

Flooding is a limitation to use of this unit as sites for roads. Roads should be provided with drainage.

This soil is in capability subclass VIw, nonirrigated.

821—Marla loamy sand, 0 to 4 percent slopes. This very deep, poorly drained soil is on alluvial fans. It formed in alluvium derived from mixed but predominantly granitic rocks. Elevation is 6,000 to 8,000 feet. The average annual precipitation is 35 to 40 inches, the average annual air temperature is 40 to 42 degrees F, and the average frost-free period is 60 to 70 days.

Typically, the surface layer is grayish brown loamy sand about 18 inches thick. The upper part of the underlying material is light yellowish brown loamy sand about 26 inches thick. The lower part of the underlying material to a depth of 60 inches or more is very pale brown loamy sand with thin strata of loam.

Included in this unit are Blackwell soils in swales and on flood plains and Inville Variant soils on terrace remnants along drainageways. The unit is about 5 percent Blackwell soils and 5 percent Inville Variant soils.

Permeability of this Marla soil is moderately rapid in the upper part of the underlying material and moderately slow in the lower part. Available water capacity is low. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 12 to 24 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. A seasonal high water table is at a depth of 12 to 24 inches in spring and early summer. This soil is subject to occasional flooding for brief periods during periods of rapid snowmelt.

This unit is used as woodland.

The present vegetation in most areas is mainly lodgepole pine and Jeffrey pine with an understory of grass. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 5,200 cubic feet, or 24,500 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. This soil is wet in the spring. Management operations should be conducted in drier periods.

Flooding is a limitation to use of this soil as sites for roads. Roads should be provided with drainage.

This soil is in capability subclass VIw, nonirrigated.

830—Fettic silty clay loam. This very deep, poorly drained soil is on low terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 4,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 95 to 110 days.

Typically, the surface layer is dark grayish brown silty clay loam about 1 inch thick. The subsoil is grayish brown clay loam about 20 inches thick. The substratum to a depth of 60 inches or more is light brownish gray stratified fine sandy loam through clay.

Included in this unit are Voltaire soils on flood plains and Truckee soils on flood plains. The unit is about 8 percent Voltaire soils and 7 percent Truckee soils.

Permeability of this Fettic soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 20 to 40 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 20 to 40 inches in spring and early summer. This soil is subject to flooding during storms of prolonged high intensity. This soil is moderately saline-and alkali-affected.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this soil as septic tank absorption fields are the high water table and the very slowly permeable subsoil. Absorption fields should be designed to avoid raising the water table and polluting the water supplies. The limitation of very slow permeability can be reduced by increasing the size of the absorption field. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and susceptibility

of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide a stable base.

The present vegetation in most areas is mainly saltgrass and basin wildrye. The production of forage is limited by salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of the concentration of salt and alkali. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

This soil is in capability subclass VIIw, nonirrigated.

831—Fettic loam. This very deep, poorly drained soil is on low terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 4,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 95 to 110 days.

Typically, the surface layer is dark grayish brown loam 4 inches thick. The subsoil is grayish brown clay loam about 16 inches thick. The substratum to a depth of 60 inches or more is light brownish gray fine sandy loam.

Included in this unit are Voltaire soils on lower flood plains and Truckee soils on flood plains. The unit is about 8 percent Voltaire soils and 7 percent Truckee soils.

Permeability of this Fettic soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 20 to 40 inches for water-sensitive plants. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 20 to 40 inches in spring and early summer. This soil is subject to flash flooding during storms of unusually high intensity. It is slightly salt- and alkali-affected in the surface layer and moderately salt- and alkali-affected in the substratum.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitations to use of this soil as septic tank absorption fields are the high water table and the very slowly permeable subsoil. Absorption fields should be designed to avoid raising the existing water table and polluting the water supplies. The limitation imposed by very slow permeability can be reduced by increasing the size of the absorption field. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitations to use of this soil as sites for roads are the low load-bearing strength and susceptibility of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide a stable base.

The present vegetation in most areas is mainly black greasewood, saltgrass, and basin wildrye. The production of forage is limited by salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of the concentration of salt and alkali. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

This soil is in capability subclass VIIw, nonirrigated.

840—Temo-Witefels-Rock outcrop association. This map unit is on mountainous uplands. Elevation is 7,500 to 9,500 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 39 to 41 degrees F, and the average frost-free period is less than 80 days.

This unit is 50 percent Temo bouldery coarse sand, 30 to 50 percent slopes; 20 percent Witefels gravelly coarse sand, 30 to 50 percent slopes; and 20 percent Rock outcrop. The Temo soil is near ridges and peaks. The Witefels soil is on side slopes. Rock outcrop is on peaks and ridges.

Included in this unit are Corbett soils at lower elevations; Graylock soils on colluvial slopes; Toiyabe soils on lower, south-facing ridges; and wet areas along intermittent streams and in snowdrift areas. The unit is about 3 percent Corbett soils, 3 percent Graylock soils, 2 percent Toiyabe soils, and 2 percent wet areas.

The Temo soil is shallow and excessively drained. It formed in residuum derived dominantly from granitic rocks. Typically, 1 to 3 percent of the surface is covered with boulders. The surface layer is grayish brown bouldery coarse sand about 10 inches thick. The underlying material to a depth of 16 inches is pale brown gravelly loamy coarse sand. Weathered bedrock is at a depth of 16 inches. Depth to weathered bedrock ranges from 8 to 20 inches.

Permeability of the Temo soil is rapid. 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 slight.

The Witefels soil is moderately deep and somewhat excessively drained. It formed in residuum derived mainly from granitic rocks. Typically, 15 to 35 percent of the surface is covered with pebbles and a few cobbles. The surface layer is grayish brown gravelly coarse sand about 8 inches thick. The underlying material to a depth of 35 inches is pale brown gravelly loamy coarse sand. Weathered bedrock is at a depth of 35 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Witefels soil is rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of granitic rocks as peaks and ridges.

This unit is used as woodland.

The present vegetation in most areas of the Temo soil is mainly Jeffrey pine, white fir, and California red fir with an understory of pinemat manzanita, squawcarpet, and snowbrush ceanothus. This soil is suited to white fir and California red fir. If planted to white fir or California red fir, it can produce about 9,350 cubic feet, or 55,100 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The present vegetation in most areas of the Witefels soil is mainly Jeffrey pine and white fir with an understory of pinemat manzanita, snowbrush ceanothus, and squawcarpet. This soil is suited to Jeffrey pine, white fir, and California red fir. If planted to Jeffrey pine, it can produce about 1,960 cubic feet, or 7,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

In this map unit, the sandy texture imposes some limitations on the use of equipment and creates a severe hazard of erosion. Stones on the surface and the presence of Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment. The steepness of slope limits the kinds of equipment that can be used in forest management.

The main limitation to use of the soils as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Temo soil is in capability subclass VIIe, nonirrigated. The Witefels soil is in capability subclass VIIs, nonirrigated.

850—Washoe gravelly sandy loam, 0 to 4 percent slopes. This very deep, well drained soil is on terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 4,800 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 15 to 30 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly sandy loam about 8 inches thick. The subsoil is light brown very gravelly sandy loam and very gravelly sandy clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown very gravelly loamy coarse sand.

Included in this unit are Oest soils along the upper edge of the unit, Orr soils on the nearly level tops of the terrace remnants, and Truckee soils in swales. The unit is about 5 percent Oest soils, 5 percent Orr soils, and 5 percent Truckee soils.

Permeability of this Washoe soil is moderately slow in the subsoil and very rapid in the substratum. 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 slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

If this unit is used for urban development, high clay content is a moderate limitation to use as sites for dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings.

The main limitations to use of this soil as septic tank absorption fields are the moderately slow permeability of the subsoil and the very rapid permeability of the substratum. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. The leach lines should not be placed in the substratum. Because the substratum is very rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

The main limitations to the use of this soil as sites for roads are the susceptibility of the soil to frost heaving and the high clay content. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush. The production of forage is limited by low precipitation. The suitability of this soil for rangeland seeding is rated as poor, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIIe, irrigated, and VIs, nonirrigated.

861—Reywat extremely stony loam, 15 to 30 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum from basic igneous rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 50 percent of the surface is covered with stones. The surface layer is grayish brown extremely stony loam about 6 inches thick. The subsoil is brown very gravelly clay loam about 12 inches thick. Bedrock is at a depth of 18 inches. Depth to bedrock ranges from 10 to 20 inches.

Included in this unit are Yuko soils on south-facing slopes; Old Camp soils near ridges and peaks; Risley soils on lower, colluvial slopes; and Tristan soils on north- and east-facing concave slopes. The unit is about 5 percent Yuko soils, 4 percent Old Camp soils, 3 percent Risley soils, and 3 percent Tristan soils.

Permeability of the Reywat soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas is mainly big sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the shallowness of the root zone, and large stones on the surface. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough soil is left to protect the unit from excessive erosion.

The main limitations to use of this soil as sites for roads are the restricted depth to bedrock and the steepness of slope. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

This soil is in capability subclass VIIs, nonirrigated.

862—Reywat very cobbly sandy loam, 8 to 15 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum of basic igneous rocks. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 35 to 50 percent of the surface is covered with cobbles. The surface layer is grayish brown very cobbly sandy loam about 6 inches thick. The subsoil is brown very gravelly clay loam about 12 inches thick. Bedrock is at a depth of 18 inches. Depth to bedrock ranges from 10 to 20 inches.

Included in this unit are Yuko soils on south-facing slopes, Old Camp soils near ridges and peaks, and Risley soils on north- and east-facing concave slopes. The unit is about 4 percent Yuko soils, 3 percent Old Camp soils, and 3 percent Risley soils.

Permeability of this Reywat soil is moderately 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to construction of dwellings is the shallowness of this soil over bedrock. Heavy equipment is needed to cut into the bedrock. The main limitation to use of this unit as septic tank absorption fields is the shallowness of this soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this unit as sites for roads is the shallowness over bedrock. Deep cuts should be avoided because of the underlying bedrock.

The present vegetation in most areas is mainly big sagebrush, green ephedra, and cheatgrass. The production of forage is limited by moderately low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the shallowness of the root zone, the large stones on the surface, and the very low available water capacity. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

863—Reywat-Rock outcrop complex, 15 to 50 percent slopes. This map unit is on mountainous uplands. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 60 percent Reywat extremely stony loam, 15 to 50 percent slopes, and 25 percent Rock outcrop. The Reywat soil is on mountain side slopes, and the Rock outcrop is on ridges and small peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Yuko soils on south-facing slopes; Old Camp soils near ridges and peaks; Risley soils on lower, colluvial slopes; and Tristan soils on north- and east-facing concave slopes. The unit is about 5 percent Yuko soils, 4 percent Old Camp soils, 3 percent Risley soils, and 3 percent Tristan soils.

The Reywat soil is shallow and well drained. It formed in residuum of basic igneous rocks. Typically, 15 to 50 percent of the surface is covered with stones. The surface layer is grayish brown extremely stony loam about 6 inches thick. The subsoil is brown very gravelly clay loam about 8 inches thick. Bedrock is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of this Reywat soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop is basic igneous rock that occurs in the form of rim rocks and prominences.

This unit is used as rangeland.

The present vegetation in most areas is mainly big sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the shallowness of the root zone over bedrock, steepness of slope, and large stones on the surface.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The main limitations to use of this unit as sites for roads are depth to bedrock and steepness of slope. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

870—Xman-Rock outcrop complex, 4 to 15 percent slopes. This map unit is on uplands. Elevation is 4,400 to 5,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 65 percent Xman extremely stony sandy loam, 4 to 15 percent slopes, and 20 percent Rock outcrop. The Xman soil is on side slopes of uplands, and the Rock outcrop is on ridges and peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Risley soils on colluvial slopes, Old Camp soils near ridges, Wedekind soils on north-facing ridges, and Manogue soils in shallow depressions. The unit is about 5 percent Risley soils, 5 percent Old Camp soils, 3 percent Wedekind soils, and 2 percent Manogue soils.

The Xman soil is shallow and well drained. It formed in residuum derived dominantly from altered volcanic rock. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is grayish brown extremely stony sandy loam about 3 inches thick. The subsoil is brown clay about 11 inches thick. Weathered bedrock is at a depth of 14 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

Permeability of the Xman 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 slight.

Rock outcrop consists of exposed areas of altered volcanic rock as ridges and small peaks.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitation to use as sites for dwellings is the high clay content. The high clay content can result in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water so that the soil near buildings is kept dry. The main limitation to use of this unit as septic tank absorption fields is the shallowness of the soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to the use of this unit as sites for roads are the low load-bearing strength and high clay content. If roads are built across areas of this unit, suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush and cheatgrass. The production of forage is limited by the low precipitation, the very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the shallowness of the root zone over bedrock, and the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

871—Xman very stony loam, 15 to 30 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from altered volcanic rocks. Elevation is 4,400 to 5,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 3 inches thick. The subsoil is brown clay about 12 inches thick. Weathered bedrock is at a

depth of 14 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

Included in this unit are Risley soils on colluvial slopes, Old Camp soils on ridges, Manogue soils in shallow depressions, and Rock outcrop as ridges or peaks. The unit is about 5 percent Risley soils, about 5 percent Old Camp soils, about 3 percent Manogue soils, and about 2 percent Rock outcrop.

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

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the main limitations to use as sites for dwellings are the steepness of slope and high clay content. The high clay content can result in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water so that the soil near buildings is kept dry. The main limitations to use of this unit as septic tank absorption fields are the shallowness of the soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength, high clay content, and steepness of slope. Suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly low sagebrush and cheatgrass. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the abrupt textural boundary, and the shallowness of the root zone. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

872—Xman very stony sandy loam, 8 to 15 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from altered volcanic rock. Elevation is 4,400 to 5,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is grayish brown very stony sandy loam about 2 inches thick. The subsoil is brown clay about 12 inches thick. Weathered bedrock is at a depth of 14 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

Included in this unit are Risley soils on colluvial slopes, Old Camp soils on ridges, Manogue soils in shallow depressions, and Rock outcrop that occurs as ridges or peaks. The unit is about 4 percent Risley soils, 5 percent Old Camp soils, 3 percent Manogue soils, and 3 percent Rock outcrop.

Permeability of this Xman 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 slight.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the main limitation to use as sites for dwellings is the high clay content. The high clay content can result in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water so that the soil near buildings is kept dry. The main limitation to use of this unit as septic tank absorption fields is the shallowness of the soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas is mainly low sagebrush and cheatgrass. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the shallowness of the root zone over bedrock, and the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

873—Xman-Rock outcrop complex, 30 to 50 percent slopes. This map unit is on uplands. Elevation is 4,400 to 5,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air

temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 60 percent Xman extremely stony sandy loam, 30 to 50 percent slopes, and 25 percent Rock outcrop. The Xman soil is on side slopes of uplands. Rock outcrop is on ridges and peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Risley soils on colluvial slopes, Old Camp soils on ridges, and Manogue soils in shallow depressions. The unit is about 6 percent Risley soils, 5 percent Old Camp soils, and 4 percent Manogue soils.

The Xman soil is shallow and well drained. It formed in residuum derived dominantly from altered volcanic rock. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is grayish brown extremely stony sandy loam about 4 inches thick. The subsoil is brown clay about 10 inches thick. Weathered bedrock is at a depth of 14 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

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

Rock outcrop consists of exposed areas of altered volcanic rock as small peaks or ridges.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the main limitations to use as sites for dwellings are the high clay content and the steepness of slope. The high clay content can result in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and diverting water so that the soil near buildings is kept dry.

The main limitations to use of this unit as septic tank absorption fields are the shallowness of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this soil as sites for roads are the low load-bearing strength, high clay content, and steepness of slope. If roads are built across areas of this unit, suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly low sagebrush and cheatgrass. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of the soil for rangeland seeding is very poor, mainly because of steepness of slope, the very low available water capacity, the shallowness of the root zone, and large stones on the surface. Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Livestock should be managed so that sufficient vegetation is left to protect the soil from excessive erosion. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This Xman soil is in capability subclass VIIs, nonirrigated.

875—Xman-Zephan-Mizel association. This map unit is on uplands. Elevation is 4,500 to 5,600 feet. The average annual precipitation is 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 35 percent Xman very stony loam, 15 to 50 percent slopes; 25 percent Zephan very stony sandy loam, 15 to 50 percent slopes; and 25 percent Mizel very gravelly coarse sandy loam, 15 to 50 percent slopes. The Xman soil is on higher, smooth upland slopes. The Zephan soil is on lower upland slopes. The Mizel soil is on south-facing slopes and on tops.

Included in this unit are Old Camp soils on ridges, Reywat soils on east- and north-facing upland slopes, Yuko soils on rounded, south-facing ridges, Risley soils on smooth to slightly convex slopes, and Rock outcrop that occurs as peaks and ridges. The unit is about 3 percent Old Camp soils, 4 percent Reywat soils, 3 percent Yuko soils, 3 percent Risley soils, and 2 percent Rock outcrop.

The Xman soil is shallow and well drained. It formed in residuum derived dominantly from volcanic rocks. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 2 inches thick. The subsoil is brown clay about 12 inches thick. Weathered, altered andesite is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

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

The Zephan soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from rhyolite and andesite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 8 inches thick. The subsoil is brown very cobbly clay about 27 inches thick. Highly weathered bedrock is at a depth of 35 inches. Depth to bedrock ranges from 25 to 40 inches.

Permeability of the Zephan soil is slow. Available water capacity is low. Effective rooting depth is 25 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Mizel soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, 50 to 60 percent of the surface is covered with gravel. The surface layer is very pale brown very gravelly coarse sandy loam about 3 inches thick. Hard rhyolite is at a depth of 3 inches. Depth to bedrock ranges from 3 to 10 inches.

Permeability of the Mizel soil is moderate. Available water capacity is very low. Effective rooting depth is 3 to 10 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Xman soil is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the abrupt textural boundary, and the shallowness of the root zone.

The present vegetation in most areas of the Zephan soil is mainly big sagebrush and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the low available water capacity and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope.

The present vegetation in most areas of the Mizel soil is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, steepness of slope, and the shallowness of the root zone.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The main limitations to use of this unit as sites for roads are the steepness of slope, high clay content, low load-bearing strength, and restricted depth over bedrock. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The soils in this unit are in capability subclass VIIs, nonirrigated.

876—Xman-Oppio-Old Camp association. This map unit is on uplands. Elevation is 4,400 to 6,000 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 35 percent Xman very stony loam, 15 to 50 percent slopes; 30 percent Oppio very stony fine sandy loam, 15 to 50 percent slopes; and 20 percent Old Camp extremely stony sandy loam, 30 to 50 percent slopes. The Xman soil is on the more rounded tops and just below ridges. The Oppio soil is on smooth, lower slopes. The Old Camp soil is on narrow ridges.

Included in this unit are Reywat soils on east- and north-facing upland slopes; Yuko soils on south-facing slopes; Skedaddle soils on convex, eroded side slopes of ridges; and Rock outcrop that occurs as peaks and ridges. The unit is about 2 percent Reywat soils, 4 percent Yuko soils, 5 percent Skedaddle soils, and 4 percent Rock outcrop.

The Xman soil is shallow and well drained. It formed in residuum derived dominantly from volcanic rocks. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 2 inches thick. The subsoil is brown clay about 12 inches thick. Weathered, altered andesite is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

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

The Oppio soil is moderately deep and well drained. It formed in residuum derived dominantly from andesite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is pale brown very stony fine sandy loam about 6 inches thick. The subsoil is brown gravelly clay about 21 inches thick. Hard, fractured bedrock is at a depth of 27 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Oppio soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

The Old Camp soil is shallow and well drained. It formed in residuum derived dominantly from volcanic rock. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is pale brown extremely stony sandy loam about 2 inches thick. The subsoil is brown very cobbly clay loam about 12 inches thick. Hard andesite is at a depth of 14 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Old Camp soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Xman soil is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, steepness of slope, shallowness of the root zone over bedrock, and the abrupt textural boundary.

The present vegetation in most areas of the Oppio soil is mainly low sagebrush and Douglas rabbitbrush. The production of forage is limited by the low precipitation, very low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is poor, mainly because of the low precipitation, steepness of slope, and large stones on the surface.

The present vegetation in most areas of the Old Camp soil is mainly big sagebrush, green ephedra, and cheatgrass. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the shallowness of the root zone over bedrock, steepness of slope, and large stones on the surface.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The main limitations to use of this unit as sites for roads are the steepness of slope, low load-bearing strength, high clay content, stones, and restricted depth to bedrock. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The Oppio soil is in capability subclass VIs, nonirrigated. The Xman and Old Camp soils are in capability subclass VIIs, nonirrigated.

877—Xman-Frodo-Mizel association. This map unit is on uplands. Elevation is 4,500 to 5,600 feet. The average annual precipitation is 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 35 percent Xman very stony loam, 15 to 50 percent slopes; 25 percent Frodo very stony loam, 8 to 30 percent slopes; and 25 percent Mizel very gravelly coarse sandy loam, 15 to 50 percent slopes. The Xman soil is on smooth slopes. The Frodo soil is on smooth, north- and east-facing plateau remnants. The Mizel soil is on south-facing slopes and rounded hilltops.

Included in this unit are Old Camp soils on ridges, Reywat soils on sharp north- and east-facing slopes, Yuko soils on shoulders of south-facing ridges, Risley soils on lower colluvial slopes, and Rock outcrop that occurs as peaks and ridges. The unit is about 5 percent Old Camp soils, 2 percent Reywat soils, 1 percent Yuko soils, 4 percent Risley soils, and 3 percent Rock outcrop.

The Xman soil is shallow and well drained. It formed in residuum derived dominantly from volcanic rock. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 2 inches thick. The subsoil is brown clay about 12 inches thick. Weathered, altered andesite is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

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

The Frodo soil is shallow and well drained. It formed in residuum and colluvium derived from volcanic rock. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony loam about 6 inches thick. The subsoil is brown clay about 12 inches thick. A continuous, strongly cemented duripan is at a depth of 18 inches. Depth to the duripan ranges from 14 to 20 inches. Below the duripan is hard bedrock.

Permeability of the Frodo soil is slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Mizel soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, 50 to 60 percent of the surface is covered with gravel. The surface layer is very pale brown very gravelly coarse sandy loam about 3 inches thick. Hard rhyolite is at a depth of 3 inches. Depth to bedrock ranges from 3 to 10 inches.

Permeability of the Mizel soil is moderate. Available water capacity is very low. Effective rooting depth is 3 to 10 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Xman soil is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this Xman soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the shallowness of the root zone, steepness of slope, and the abrupt textural boundary.

The present vegetation in most areas of the Frodo soil is mainly low sagebrush, Douglas rabbitbrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over the hardpan. The

suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the shallowness of the root zone over the hardpan.

The present vegetation in most areas of the Mizel soil is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, steepness of slope, and the shallowness of the root zone over the hardpan.

Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Livestock should be managed so that sufficient vegetation is left to protect the soils from excessive erosion.

The main limitations to use of this unit as sites for roads are the steepness of slope, low load-bearing strength, high clay content, and shallowness of the soils over bedrock. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in the less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The soils in this unit are in capability subclass VIIs, nonirrigated.

880—Zephan-Rock outcrop-Smallcone complex, 15 to 50 percent slopes. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 30 percent Zephan very gravelly sandy loam, 15 to 50 percent slopes; 30 percent Rock outcrop; and 25 percent Smallcone very gravelly sandy loam, 15 to 50 percent slopes. The Zephan soil is on smooth side slopes of uplands. The Rock outcrop is on ridges and peaks. The Smallcone soil is on rounded hilltops and spur ridges. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Yuko soils on rounded, south-facing shoulders of ridges and Xman soils on smooth or slightly concave slopes. The unit is about 8 percent Yuko soils and 7 percent Xman soils.

The Zephan soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from rhyolite and altered andesite. Typically, 35 to 45 percent of the surface is covered with gravel. The surface layer is brown very gravelly sandy loam about 8 inches thick. The subsoil is brown very cobbly clay about 27 inches thick. Weathered bedrock is at a depth of 35 inches. Depth to weathered bedrock ranges from 25 to 40 inches.

Permeability of the Zephan soil is slow. Available water capacity is low. Effective rooting depth is 24 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of rhyolitic and andesitic rocks as peaks and ridges.

The Smallcone soil is very shallow and well drained. It formed in residuum derived dominantly from altered andesite. Typically, the Smallcone soil is very pale brown very gravelly sandy loam about 6 inches deep over hard altered volcanic bedrock. Depth to weathered andesite ranges from 4 to 10 inches.

Permeability of the Smallcone soil is rapid. Available water capacity is very low. Effective rooting depth is 4 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as woodland and rangeland.

The present vegetation in most areas of the Zephan soil is mainly big sagebrush and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the low available water capacity and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The present vegetation in most areas of the Smallcone soil is a sparse stand of Jeffrey pine with an extremely thin understory of big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of merchantable timber is very low, and natural regeneration of trees is difficult because of the shallowness of the soil, the marginal precipitation, and plant competition. If the woodland is to be maintained, only selective harvesting should be practiced. Management that minimizes the risk of erosion during harvesting of timber is essential. Steepness of slope limits the kinds of equipment that can be used.

The main limitations to use of this unit as sites for roads are the steepness of slope, low load-bearing strength, and high clay content. Suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be located in less slopiong areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

881—Zephan very gravelly sandy loam, 30 to 50 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum and colluvium derived dominantly from rhyolite and altered andesite.

Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is brown very gravelly sandy loam about 8 inches thick. The subsoil is brown very cobbly clay about 27 inches thick. Highly weathered bedrock is at a depth of 35 inches. Depth to bedrock ranges from 25 to 40 inches.

Included in this unit are Yuko soils on rounded shoulders of ridges, Xman soils on smooth or slightly concave slopes near ridges, and Rock outcrop that occurs as small peaks or ridges. The unit is about 6 percent Yuko soils, 5 percent Xman soils, and 4 percent Rock outcrop.

Permeability of this Zephan soil is slow. Available water capacity is low. Effective rooting depth is 25 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitations to use of this unit as sites for dwellings are the steepness of slope and high clay content. The high clay content can result in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and diverting water so that the soil near buildings is kept dry.

The main limitations to use of this unit as septic tank absorption fields are the restricted depth of the soil over bedrock, the slowly permeable subsoil, and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength, high clay content, and steepness of slope. If roads are built across areas of this soil, suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation, low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

882—Zephan stony sandy loam, 15 to 30 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum and colluvium derived dominantly from rhyolite and altered andesite. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 47 to 51 degrees F, and the frost-free period is 100 to 110 days.

Typically, 2 to 3 percent of the surface is covered with stones. The surface layer is brown stony sandy loam about 8 inches thick. The subsoil is brown very cobbly clay about 27 inches thick. Highly weathered bedrock is at a depth of 35 inches. Depth to highly weathered bedrock ranges from 25 to 40 inches.

Included in this unit are shallow Yuko soils on rounded shoulders of ridges, Xman soils on smooth or slightly concave slopes near ridges, and Rock outcrop that occurs as small peaks or ridges. The unit is about 6 percent Yuko soils, 5 percent Xman soils, and 4 percent Rock outcrop.

Permeability of this Zephan soil is slow. Available water capacity is low. Effective rooting depth is 25 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitations to use of this unit as sites for dwellings are the steepness of slope and high clay content. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water so that the soil near buildings is kept dry.

The main limitations to use of this soil as septic tank absorption fields are the restricted depth of the soil over bedrock, the slowly permeable subsoil, and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength, high clay content, and steepness of slope. Suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush and bottlebrush squirreltail. Scattered

throughout the areas is a small amount of juniper. The production of forage is limited by the moderately low precipitation, low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is poor, mainly because of the moderately low precipitation and steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

890—Indiano gravelly loam, warm, 15 to 30 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum derived dominantly from volcanic and metavolcanic rocks. Elevation is 4,800 to 5,000 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 15 to 30 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly loam about 14 inches thick. The subsoil is yellowish brown clay loam about 15 inches thick. Bedrock is at a depth of 29 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are Zephan soils on lower, colluvial slopes; Wedekind soils on north- and east-facing slopes; and Koontz soils on ridges. The unit is about 5 percent Zephan soils, 5 percent Wedekind soils, and 5 percent Koontz soils.

Permeability of this Indiano soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the main limitation to use as sites for dwellings is the steepness of slope. The moderately high shrink-swell potential of this soil can cause structural damage to buildings. Structural damage can be prevented by properly designing foundations and footings and diverting water so that the soil near buildings is kept dry.

The main limitation to use of this unit as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Nevada bluegrass. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation, restricted depth of the root zone over bedrock, and the moderate available water capacity. The suitability of this soil for rangeland seeding is fair. The main limitations to seeding are the moderately low precipitation and the restricted depth of the root zone over bedrock. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIe, nonirrigated.

891—Indiano gravelly loam, warm, 30 to 50 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum derived dominantly from metavolcanic rocks. Elevation is 4,800 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 110 days.

Typically, 25 to 35 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly loam about 14 inches thick. The subsoil is yellowish brown clay loam about 15 inches thick. Bedrock is at a depth of 29 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are Zephan soils on lower, colluvial slopes; Koontz soils on ridges; and Wedekind soils on north- and east-facing slopes. The unit is about 5 percent Zephan soils, 5 percent Koontz soils, and 5 percent Wedekind soils.

Permeability of this Indiano soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

If this soil is used for urban development, the main limitation to use as sites for dwellings is the steepness of slope. The moderately high shrink-swell potential of this soil can cause structural damage to buildings. Structural damage can be prevented by properly designing foundations and footings and diverting water so that the soil near buildings is kept dry.

The main limitations to use of this unit as septic tank absorption fields are the restricted depth of the soil over bedrock, the moderately slowly permeable subsoil, and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this soil as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Nevada bluegrass. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation, moderate available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIe, nonirrigated.

892—Indiano-Koontz-Flex association. This map unit is on uplands. Elevation is 5,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 35 percent Indiano gravelly loam, warm, 30 to 50 percent slopes; 30 percent Koontz cobbly loam, 30 to 50 percent slopes; and 20 percent Flex very gravelly sandy loam, 30 to 50 percent slopes. The Indiano soil is on side slopes. The Koontz soil is on north- and east-facing slopes of ridges. The Flex soil is on south- and west-facing slopes of ridges.

Included in this unit are Burnborough soils on higher north slopes where snow pockets form; Ticino soils, which support mountainmahogany and occur on higher ridges; Old Camp soils on ridges; Wedekind soils on north- and east-facing slopes; and Gabica soils on high, windswept ridges. The unit is about 3 percent Burnborough soils, 2 percent Ticino soils, 4 percent Old Camp soils, 4 percent Wedekind soils, and 2 percent Gabica soils.

The Indiano soil is moderately deep and well drained. It formed in residuum derived dominantly from metavolcanic rocks. Typically, 15 to 35 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly loam about 13 inches thick. The subsoil is yellowish brown clay loam about 20 inches thick. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Indiano soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Koontz soil is shallow and well drained. It formed in residuum derived dominantly from metamorphic rocks. Typically, 15 to 25 percent of the surface is covered with cobbles. The surface layer is brown cobbly loam about 6 inches thick. The subsoil is brown and yellowish brown very gravelly clay loam about 12 inches thick. Depth to weathered bedrock ranges from 14 to 20 inches.

Permeability of the Koontz soil is moderately slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Flex soil is shallow and well drained. It formed in residuum derived dominantly from andesite and metavolcanic rocks. Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is light brownish gray very gravelly sandy loam about 3 inches thick. The subsoil is brown very gravelly sandy loam about 7 inches thick. Highly weathered bedrock is at a depth of 10 inches. Depth to bedrock ranges from 6 to 12 inches.

Permeability of the Flex soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 12 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Indiano soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation, moderate available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope.

The present vegetation in most areas of the Koontz soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the shallowness of the root zone over bedrock, and steepness of slope.

The present vegetation in most areas of the Flex soil is mainly big sagebrush, green ephedra, and cheatgrass. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, the shallowness of the root zone, and steepness of slope.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The main limitation to use of this unit as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Indiano soil is in capability subclass VIIe, nonirrigated. The Koontz and Flex soils are in capability subclass VIIs, nonirrigated.

893—Indiano-Duco-Cagle association. This map unit is on uplands. Elevation is 5,400 to 6,000 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 35 percent Indiano stony fine sandy loam, 15 to 30 percent slopes; 30 percent Duco very stony sandy loam, 30 to 50 percent slopes; and 20 percent Cagle very stony clay loam, 15 to 30 percent slopes. The Indiano soil is on slightly convex upland slopes. The Duco soil is on ridges. The Cagle soil is on slightly concave upland slopes.

Included in this unit are Nosrac soils on north-facing colluvial slopes, Koontz soils near ridges, Old Camp soils on ridges, Rock outcrop that occurs as small peaks and ridges, and Waspo soils on eroded surfaces. The unit is about 2 percent Nosrac soils, 4 percent Koontz soils, 4 percent Old Camp soils, 2 percent Rock outcrop, and 3 percent Waspo soils.

The Indiano soil is moderately deep and well drained. It formed in residuum derived dominantly from metavolcanic rocks. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony fine sandy loam about 13 inches thick. The subsoil is yellowish brown clay loam about 20 inches thick. Weathered metavolcanic rock is at a depth of 33 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Indiano soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Duco soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 5 inches thick. The subsoil is brown very cobbly clay loam about 14 inches thick. Bedrock is at a depth of 19 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Duco soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Cagle soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from andesite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is grayish brown very stony clay loam about 7 inches thick. The subsoil is brown and pale brown gravelly clay about 16 inches thick. Highly weathered andesite is at a depth of 23 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Cagle soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Indiano soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation, moderate available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is fair. The main limitations for seeding are the moderately low precipitation, steepness of slope, and large stones on the surface.

The present vegetation in most areas of the Duco soil is mainly western juniper and pinyon with an understory of big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity, the shallowness of the root zone over bedrock, and competition of the trees. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, the steepness of slope, and the shallowness of the root zone. In wooded areas, a mature stand of trees (80 to 100 years) will yield about 4 to 8 cords of wood per acre.

The present vegetation in most areas of the Cagle soil is mainly western juniper and pinyon with an understory of big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation, low available water capacity, and the restricted depth of the root zone over bedrock. This soil is rated as very poorly suited to rangeland seeding because of the steepness of slope. In wooded areas, a mature stand of trees (80 to 100 years) will yield about 3 to 6 cords of wood per acre.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

The main limitations to use of this unit as sites for roads are the steepness of slope of the Indiano soil, steepness of slope and shallowness over bedrock of the Duco soil, and steepness of slope and high clay content of the Cagle soil. Suitable material should be added to provide an adequate wearing surface. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Indiano soil is in capability subclass VIIe, nonirrigated. The Duco and Cagle soils are in capability subclass VIIs, nonirrigated.

894—Indiano-Duco-Skedaddle association. This map unit is on uplands. Elevation is 4,400 to 7,200 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 40 percent Indiano stony fine sandy loam, 15 to 50 percent slopes; 30 percent Duco very stony sandy loam, 30 to 50 percent slopes; and 15 percent Skedaddle very stony loam, 30 to 70 percent slopes. The Indiano soil is on side slopes. The Duco soil is on ridges. The Skedaddle soil is on eroded south-facing slopes.

Included in this unit are Cagle soils on lower colluvial slopes, Old Camp soils on spur ridges, Ticino soils that occur on ridges and support mountainmahogany, Washoe soils near drainageways, and Rock outcrop as peaks. The unit is about 5 percent Cagle soils, 3 percent Old Camp soils, 2 percent Ticino soils, 3 percent Washoe soils, and 2 percent Rock outcrop.

The Indiano soil is moderately deep and well drained. It formed in residuum derived dominantly from metavolcanic rocks. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony fine sandy loam about 13 inches thick. The subsoil is yellowish brown clay loam about 20 inches thick. Weathered metavolcanic rock is at a depth of 33 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Indiano soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Duco soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 5 inches thick. The subsoil is brown very cobbly clay loam about 14 inches thick. Bedrock is at a depth of 19 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Duco soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Skedaddle soil is very shallow and well drained. It formed in residuum derived dominantly from metavolcanic rock. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 5 inches thick. Weathered bedrock is at a depth of 5 inches. Depth to hard bedrock ranges from 4 to 12 inches.

Permeability of the Skedaddle soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 12 inches. Runoff is medium to rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Indiano soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation, moderate available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is fair. The main limitations for seeding are the moderately low precipitation, steepness of slope, and large stones on the surface.

The present vegetation in most areas of the Duco soil is mainly western juniper with an understory of big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity, the shallowness of the root zone over bedrock, and competition of the trees. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, the steepness of slope, and the shallowness of the root zone. In wooded areas, a mature stand of trees (80 to 100 years) will yield about 4 to 8 cords of wood per acre.

The present vegetation in most areas of the Skedaddle soil is mainly big sagebrush, green ephedra, and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, steepness of slope, large stones on the surface, and shallowness of the root zone.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

The main limitations to use of this unit as sites for roads are the steepness of slope and restricted depth to bedrock. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Indiano soil is in capability subclass VIIe, nonirrigated. The Duco and Skedaddle soils are in capability subclass VIIs, nonirrigated.

895—Indiano-Zephan-Duco association. This map unit is on uplands. Elevation is 5,000 to 7,200 feet. The average annual precipitation is 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 35 percent Indiano stony fine sandy loam, 15 to 30 percent slopes; 30 percent Zephan very stony

sandy loam, 15 to 50 percent slopes; and 20 percent Duco very stony sandy loam, 15 to 50 percent slopes. The Indiano soil is on upper parts of upland slopes. The Zephan soil is on lower upland slopes. The Duco soil is on ridges.

Included in this unit are Mizel soils on eroded south-facing slopes; Arzo soils on lower, colluvial slopes; Old Camp soils on ridges; and Wedekind soils on east- and north-facing slopes. The unit is about 4 percent Mizel soils, 4 percent Arzo soils, 3 percent Old Camp soils, and 4 percent Wedekind soils.

The Indiano soil is moderately deep and well drained. It formed in residuum derived dominantly from metavolcanic rocks. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony fine sandy loam about 13 inches thick. The subsoil is yellowish brown clay loam about 20 inches thick. Weathered metavolcanic rock is at a depth of 33 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Indiano soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Zephan soil is moderately deep and well drained. It formed in residuum and colluvium derived from mixed rocks, mostly rhyolite and andesite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 8 inches thick. The subsoil is brown very cobbly clay about 27 inches thick. Highly weathered bedrock is at a depth of 35 inches. Depth to bedrock ranges from 25 to 40 inches.

Permeability of the Zephan soil is slow. Available water capacity is low. Effective rooting depth is 25 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Duco soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 7 inches thick. The subsoil is brown very cobbly clay loam about 8 inches thick. Bedrock is at a depth of 15 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Duco soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Indiano soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation, moderate available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is fair. The main limitations for seeding are the moderately low precipitation and large stones on the surface.

The present vegetation in most areas of the Zephan soil is mainly big sagebrush and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the low available water capacity and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope.

The present vegetation in most areas of the Duco soil is mainly western juniper with an understory of big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity, the shallowness of the root zone over bedrock, and competition of the trees. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, steepness of slope, and shallowness of the root zone. In wooded areas, a mature stand of trees (80 to 100 years) will yield about 4 to 8 cords of wood per acre.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

The main limitations to use of this unit as sites for roads are the steepness of slope, high clay content, low load-bearing strength, and restricted depth to bedrock. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The Indiano soil is in capability subclass VIIe, nonirrigated. The Zephan and Duco soils are in capability subclass VIIs, nonirrigated.

900—Flex very gravelly sandy loam, 15 to 30 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from altered andesite and metavolcanic rocks. Elevation is 5,000 to 6,200 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is light grayish brown very gravelly sandy loam about 3 inches thick. The subsoil is brown very gravelly sandy clay loam about 7 inches thick. Highly weathered bedrock is at a depth of 10

inches. Depth to weathered bedrock ranges from 6 to 12 inches.

Included in this unit are Wedekind soils on smooth north-facing slopes, Yuko soils on rounded shoulders of ridges, Koontz soils on north-facing ridges, and Rock outcrop on ridges and peaks. The unit is about 6 percent Wedekind soils, 4 percent Yuko soils, 3 percent Koontz soils, and 2 percent Rock outcrop.

Permeability of this Flex soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 12 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the steepness of slope. The main limitations to use of the unit as septic tank absorption fields are the shallowness of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, green ephedra, and cheatgrass. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the shallowness of the root zone over bedrock and the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

901—Flex very gravelly sandy loam, 30 to 50 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from altered andesite and metavolcanic rocks. Elevation is 5,000 to 6,200 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is light grayish brown very gravelly sandy loam about 4 inches thick. The subsoil is brown very gravelly sandy clay loam about 6 inches thick. Highly weathered bedrock is at a depth of 10 inches. Depth to weathered bedrock ranges from 6 to 12 inches.

Included in this unit are Wedekind soils on north-facing slopes, Yuko soils on rounded shoulders of ridges, Koontz soils on ridges, and Rock outcrop, which occurs as ridges and peaks. The unit is about 5 percent Wedekind soils, 4 percent Yuko soils, 3 percent Koontz soils, and 3 percent Rock outcrop.

Permeability of this Flex soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 12 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the shallowness of the soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to use of this unit as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, green ephedra, and cheatgrass. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope, the shallowness of the root zone over bedrock, and the very low available water capacity of the surface layer. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

903—Flex stony sandy loam, 8 to 15 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from altered andesite and metavolcanic rocks. Elevation is 5,000 to 6,200 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 100 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is light grayish brown stony sandy loam about 3 inches thick. The subsoil is brown very gravelly sandy clay loam about 7 inches thick.

Highly weathered bedrock is at a depth of 10 inches. Depth to weathered bedrock ranges from 6 to 12 inches.

Included in this unit are Wedekind soils on north-facing slopes, Yuko soils on rounded shoulders of ridges, Koontz soils on north-facing ridges, and Rock outcrop as small peaks. The unit is about 5 percent Wedekind soils, 4 percent Yuko soils, 4 percent Koontz soils, and 2 percent Rock outcrop.

Permeability of this Flex soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 12 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The steepness of slope and shallowness of this soil over bedrock are moderate limitations to use of this unit as sites for dwellings. Heavy equipment is needed to cut into the bedrock. The main limitation to use of the unit as septic tank absorption fields is the shallowness of this soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The shallowness of the soil over bedrock, steepness of slope, and susceptibility of this soil to frost heaving are moderate limitations to use of the unit as sites for roads. Drainage should be provided. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and green ephedra. Forage production is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the shallowness of the root zone and the very low available water capacity. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

910—Vamp fine sandy loam, slightly saline-alkali. This moderately deep, somewhat poorly drained soil is on flood plains and low terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,400 to 4,600 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown fine sandy loam about 3 inches thick. Below this is a layer of light grayish brown and pale brown, stratified fine sandy loam and loam about 33 inches thick. The next layer is a white strongly cemented hardpan about 6 inches thick. The underlying material to a depth of 60 inches is yellowish brown and light olive gray, stratified loam, sandy loam, and loamy sand. Depth to the hardpan ranges from 20 to 40 inches.

Included in this unit are Truckee soils on lower flood plains and Voltaire soils in shallow depressions on flood plains. The unit is about 8 percent Truckee soils and about 7 percent Voltaire soils.

Permeability of this Vamp soil is moderate. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 30 to 40 inches in spring and early summer. This soil is subject to flooding during prolonged storms of high intensity. Channeling and deposition are common along streambanks. The soil is slightly saline- and alkali-affected.

This unit is used for urban development, crops, pasture, and hayland.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The hardpan and the high water table are limitations for septic tank absorption fields. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. In drained areas, ripping the hardpan improves the suitability of the soil for septic tank absorption fields. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of the unit as sites for roads is the susceptibility of this soil to frost heaving. Roads should be provided with drainage and an adequate wearing surface.

If this unit is used for irrigated crops, the content of salt and alkali, the hardpan, and the high water table are limitations. Under good management that includes a conservation cropping system, this soil will produce yields of 30 bushels per acre of barley. The hardpan can be ripped to increase the depth of the root zone. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid overirrigating and leaching of plant nutrients and to avoid raising the existing water table or creating a perched water table above the hardpan.

The present vegetation in most areas is grass. Under a good management system, this soil will produce yields of 2 tons per acre of alfalfa, 2 tons per acre of improved meadow hay, or 5 animal-unit-months per acre of pasture. If this unit is used for hay and pasture, the main limitations are the content of salt and alkali and the high water table. The high water table limits the leaching of salts from the surface layer. The concentration of salts and alkali in the surface layer limits forage production

and the selection of plants suitable for hay and pasture. Shallow-rooted, water-tolerant plants are suited. Lowering the water table through artificial drainage helps to reduce salt and alkali concentrations and to improve forage production. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the needs of the crop to avoid raising the water table and increasing the concentration of salts and alkali.

This unit is in capability subclasses IIIw, irrigated, and VIw, nonirrigated.

911—Vamp silt loam, strongly saline-alkali. This moderately deep, somewhat poorly drained soil is on flood plains and terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 4,600 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown silt loam about 3 inches thick. Below this is a layer of light grayish brown and pale brown, stratified fine sandy loam and loam about 33 inches thick. The next layer is a white, strongly cemented hardpan about 6 inches thick. The next layer to a depth of 60 inches is yellowish brown and light olive gray, stratified loam, sandy loam, and loamy sand. Depth to the hardpan ranges from 20 to 40 inches.

Included in this unit are Truckee soils on lower flood plains, Voltaire soils in shallow depressions in flood plains, and Fettic soils on low terraces. The unit is about 6 percent Truckee soils, 5 percent Voltaire soils, and 4 percent Fettic soils.

Permeability of this Vamp soil is moderate. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 30 to 40 inches in spring and early summer. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. The soil is strongly saline- and alkali-affected.

This unit is used for urban development.

Flooding is a limitation to use of the unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of the unit as septic tank absorption fields are the hardpan and the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. In drained areas, the suitability of the soil for septic tank absorption fields can be improved by ripping the hardpan. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The main limitation to use of this unit as sites for roads is the susceptibility of this soil to frost heaving. Drainage should be provided. Suitable material should be added to provide an adequate wearing surface.

930—Old Camp stony sandy loam, 15 to 30 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from volcanic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 43 to 47 degrees F, and the average frost-free period is 100 to 120 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is pale brown stony sandy loam about 7 inches thick. The subsoil is brown very cobbly clay loam about 10 inches thick. Hard andesite is at a depth of 17 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Included in this unit are Manogue soils in saddles, Xman soils on the less sloping areas, Reywat soils on north-facing slopes, and Rock outcrop as small peaks or ridges. The unit is about 3 percent Manogue soils, 4 percent Xman soils, 4 percent Reywat soils, and 4 percent Rock outcrop.

Permeability of this Old Camp soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitations for construction of dwellings are the steepness of slope, stones, and the shallowness of this soil over bedrock. Heavy equipment is needed to cut into the bedrock and to excavate the large stones. The main limitations to use of this unit as septic tank absorption fields are the shallowness of this soil over bedrock, the steepness of slope, and large stones in the subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed. Large stones in the soil make preparing sites for absorption fields more difficult and also decrease the suitability of the soil for use as a filter.

The main limitations to use of this unit as sites for roads are the shallowness of this soil over bedrock, the steepness of slope, and stones. Suitable material should be added to provide an adequate wearing surface. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and cheatgrass. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and the shallowness of the root zone. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

931—Old Camp-Rock outcrop complex, 15 to 50 percent slopes. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 43 to 47 degrees F, and the average frost-free period is 100 to 120 days.

This unit is 50 percent Old Camp extremely stony sandy loam, 30 to 50 percent slopes; 20 percent Old Camp stony sandy loam, 15 to 30 percent slopes; and 20 percent Rock outcrop. The Old Camp extremely stony sandy loam is near Rock outcrop on peaks and ridges. The Old Camp stony sandy loam is on rounded ridges and between peaks. Rock outcrop is on peaks and ridges. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Manogue soils on toe slopes and in saddles, Xman soils in the less sloping areas, and Reywat soils on north-facing slopes. The unit is about 3 percent Manogue soils, 4 percent Xman soils, and 3 percent Reywat soils.

The Old Camp extremely stony soil is shallow and well drained. It formed in residuum derived dominantly from volcanic rock. Slope is 30 to 50 percent. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is pale brown extremely stony sandy loam about 7 inches thick. The subsoil is brown very cobbly clay loam about 10 inches thick. Hard andesite bedrock is at a depth of 17 inches. Depth to hard bedrock ranges from 10 to 20 inches.

The Old Camp stony soil is shallow and well drained. It formed in residuum derived dominantly from volcanic rocks. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is pale brown stony sandy loam about 8 inches thick. The subsoil is brown very cobbly clay loam about 9 inches thick. Hard andesite bedrock is at a depth of 17 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of both Old Camp soils is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of volcanic rock as peaks.

This unit is used for urban development and as rangeland.

The main limitations for construction of dwellings are the steepness of slope, stones, and shallowness of the soils over bedrock. Heavy equipment is needed to cut into the bedrock and to excavate the large stones. The main limitations to use of the unit as septic tank absorption fields are the shallowness of the soils over bedrock, the steepness of slope, and large stones in the subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed. Large stones in the soil make preparing sites for absorption fields more difficult and also decrease the suitability of the soil for use as a filter.

The main limitations to use of this unit as sites for roads are the shallowness of the soils over bedrock, steepness of slope, and stones. Suitable material should be added to provide an adequate wearing surface. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and cheatgrass. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of these soils for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, steepness of slope, and the shallowness of the root zone. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The soils in this unit are in capability subclass VIIs, nonirrigated.

932—Old Camp stony sandy loam, 8 to 15 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from volcanic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 43 to 47 degrees F, and the average frost-free period is 100 to 120 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is pale brown stony sandy loam about 7 inches thick. The subsoil is brown very cobbly clay loam about 10 inches thick. Hard andesite

bedrock is at a depth of 17 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Included in this unit are Manogue soils on toe slopes and in saddles; Xman soils on smooth, less sloping areas; Reywat soils on north-facing slopes; and Rock outcrop, which occurs as small peaks and ridges. The unit is about 3 percent Manogue soils, 4 percent Xman soils, 4 percent Reywat soils, and 4 percent Rock outcrop.

Permeability of this Old Camp soil is moderately 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 slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitations for construction of dwellings are depth to bedrock and stones. Heavy equipment is needed to cut into the bedrock and to excavate the large stones. The main limitations to use of this unit as septic tank absorption fields are the shallowness of the soil over bedrock and large stones in the subsoil. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed. Large stones in the soil make preparing sites for absorption fields more difficult and also decrease the suitability of the soil for use as a filter.

The main limitation to use of this unit as sites for roads is the shallowness of the soil over bedrock and stones. Suitable material should be added to provide an adequate wearing surface. Deep cuts should be avoided because of the underlying bedrock.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and the shallowness of the root zone over bedrock. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

960—Kayo stony sandy loam, 2 to 4 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,200 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is brown stony sandy loam about 11 inches thick. The subsoil is brown very gravelly sandy loam about 11 inches thick. The substratum to a depth of 60 inches or more is brown, stratified very gravelly loamy coarse sand and very gravelly sandy loam.

Included in this unit are Aladshi soils on lower terraces; Indian Creek soils on higher terrace remnants; Stumble soils on small, inset alluvial fans; and Holbrook soils, which occur in drainageways and are flooded in most years for short periods. The unit is about 6 percent Aladshi soils, 4 percent Indian Creek soils, 3 percent Stumble soils, and 2 percent Holbrook soils.

Permeability of this Kayo soil is moderately rapid in the subsoil and rapid in the substratum. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Flooding and the susceptibility of this soil to frost heaving are moderate limitations to use of this soil as sites for roads. Drainage is needed. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly spiny hopsage, big sagebrush, and Indian ricegrass. The production of forage is limited by the low precipitation and low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

961—Kayo stony sandy loam, 4 to 8 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,200 feet. The average annual precipitation is about 8 to 10 inches, the

average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is brown stony sandy loam about 11 inches thick. The subsoil is brown very gravelly sandy loam about 11 inches thick. The substratum to a depth of 60 inches or more is brown, stratified very gravelly loamy coarse sand and very gravelly sandy loam.

Included in this unit are Aladshi soils on lower terraces; Indian Creek soils on higher terrace remnants; Stumble soils on small, inset alluvial fans; and Holbrook soils, which occur near drainageways and are subject to flooding in most years. The unit is about 6 percent Aladshi soils, 4 percent Indian Creek soils, 3 percent Stumble soils, and 2 percent Holbrook soils.

Permeability of this Kayo soil is moderately rapid in the subsoil and rapid in the substratum. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Flooding and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Drainage is needed. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and Indian ricegrass. The production of forage is limited by the low precipitation and low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

962—Kayo very stony sandy loam, 4 to 8 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,200 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 10 inches thick. The subsoil is brown very gravelly sandy loam about 15 inches thick. The substratum to a depth of 60 inches or more is brown, stratified very gravelly loamy coarse sand and very gravelly sandy loam.

Included in this unit are Aladshi soils on lower terrraces; Indian Creek soils on higher terrace remnants, Stumble soils on small, inset alluvial fans; and Holbrook soils, which occur near drainageways and are subject to flooding in most years. The unit is about 6 percent Aladshi soils, 4 percent Indian Creek soils, 3 percent Stumble soils, and 2 percent Holbrook soils.

Permeability of this Kayo soil is moderately rapid in the subsoil and rapid in the substratum. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum, which allows the leachate to run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Flooding and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage and an adequate wearing surface.

The present vegetation in most areas is mainly spiny hopsage, big sagebrush, and Indian ricegrass. The production of forage is limited by the low precipitation and low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

963—Kayo very stony sandy loam, 15 to 30 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans and terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,200 feet. The average annual precipitation is

about 8 to 10 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 11 inches thick. The subsoil is brown very gravelly sandy loam about 11 inches thick. The substratum to a depth of 60 inches or more is brown, stratified very gravelly loamy coarse sand and very gravelly sandy loam.

Included in this unit are Aladshi soils on lower terraces; Indian Creek soils on higher terrace remnants; Stumble soils on small, inset alluvial fans; and Holbrook soils, which occur near drainageways and are subject to flooding in most years. The unit is about 6 percent Aladshi soils, 4 percent Indian Creek soils, 3 percent Stumble soils, and 2 percent Holbrook soils.

Permeability of this Kayo soil is moderately rapid in the subsoil and rapid in the substratum. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland.

Flooding and the steepness of slope are limitations to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitations to use of this unit as septic tank absorption fields are the rapidly permeable substratum and the steepness of slope. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. Care should be taken to prevent surfacing of the leachate downslope.

The main limitation to use of this unit as sites for roads is steepness of slope. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and Indian ricegrass. The production of forage is limited by the low precipitation and low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

971—Aladshi sandy loam, 2 to 4 percent slopes. This very deep, well drained soil is on alluvial fans and low stream terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,200 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

The surface layer is light brownish gray sandy loam about 7 inches thick. The subsoil is brown sandy clay loam about 27 inches thick. The substratum to a depth of 60 inches or more is stratified very gravelly loam to extremely gravelly loamy sand.

Included in this unit are Kayo soils on higher alluvial fan skirts; Indian Creek soils on higher terrace remnants; Turria soils on small, inset alluvial fans; and Holbrook soils, which occur near drainageways and are subject to flooding for short periods in most years. The unit is about 6 percent Kayo soils, 4 percent Indian Creek soils, 3 percent Turria soils, and 2 percent Holbrook soils.

Permeability of this Aladshi soil 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 slight. The hazard of soil blowing is slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. Percolation can also be improved in some areas by placing the leach line below the least permeable layer.

The susceptibility of this soil to frost heaving, the high clay content, and flooding are moderate limitations to use of this unit as sites for roads. Drainage should be provided. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and bottlebrush squirreltail. The production of forage is limited by the low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because the precipitation is low. The intensity and duration of grazing should be adjusted to season of growth and to precipitation.

This soil is in capability subclasses IIe, irrigated, and VIc, nonirrigated.

974—Aladshi gravelly sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,200 feet. The average annual precipitation is about 7 to 9 inches, the

average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 35 percent of the surface is covered with gravel. The surface layer is light brownish gray gravelly sandy loam about 6 inches thick. The subsoil is brown sandy clay loam about 28 inches thick. The substratum to a depth of 60 inches or more is stratified very gravelly loam to extremely gravelly loamy sand.

Included in this unit are Kayo soils on higher alluvial fan skirts; Indian Creek soils on higher terrace remnants; Turria soils on small, inset alluvial fans; and Holbrook soils, which occur near drainageways and are subject to flooding for short periods in most years. The unit is about 6 percent Kayo soils, 4 percent Indian Creek soils, 3 percent Turria soils, and 2 percent Holbrook soils.

Permeability of this Aladshi soil 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 slight. The hazard of soil blowing is slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. Percolation can also be improved in some areas by placing the leach line below the least permeable layer.

The susceptibility of this soil to frost heaving, high clay content, and flooding are moderate limitations to use of this soil as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and bottlebrush squirreltail. The production of forage is limited by the low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the low precipitation and the low available water capacity of the surface layer. The intensity and duration of grazing should be adjusted to season of growth and to precipitation.

This soil is in capability subclasses IIIe, irrigated, and VIc, nonirrigated.

980—Koontz gravelly loam, 8 to 15 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from metamorphic rocks. Elevation is 5,300 to 6,300 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 20 to 35 percent of the surface is covered with gravel. The surface layer is brown gravelly loam about 5 inches thick. The subsoil is brown and yellowish brown very gravelly clay loam about 13 inches thick. Weathered, metamorphosed, tuffaceous sediments occur at a depth of 18 inches. Depth to bedrock ranges from 14 to 20 inches.

Included in this unit are Old Camp soils on ridges, Yuko soils on south-facing slopes, and Wedekind soils on north-facing slopes. The unit is about 5 percent Old Camp soils, 5 percent Yuko soils, and 5 percent Wedekind soils.

Permeability of this Koontz soil is moderately slow. Available water capacity is very low. Effective rooting depth is 14 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 urban development and as rangeland.

The high clay content, the steepness of slope, and the shallowness of this soil over bedrock are moderate limitations to use of this unit as sites for dwellings. Heavy equipment is needed to cut into the bedrock. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and diverting water so that the soil near buildings is kept dry. The main limitation to use of this unit as septic tank absorption fields is the shallowness of this soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize this limitation. If the density of housing is too high, however, community sewage systems are needed.

The shallowness of this soil over bedrock, the susceptibility of the soil to frost action, and steepness of slope are the main limitations to use of this unit as sites for roads. Drainage should be provided. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the shallowness of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the shallowness of the root zone over bedrock and the very low available water capacity. Grazing should be delayed until the soil is firm and the more desirable

plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

982—Koontz stony loam, 15 to 30 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from metavolcanic rocks. Elevation is 5,300 to 6,300 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 0.1 to 2 percent of the surface is covered with stones. The surface layer is brown stony loam about 6 inches thick. The subsoil is brown and yellowish brown very gravelly clay loam about 12 inches thick. Weathered, metamorphosed, tuffaceous sediments occur at a depth of 18 inches. Depth to bedrock ranges from 14 to 20 inches.

Included in this unit are Old Camp soils on ridges, Yuko soils on south-facing slopes, and Wedekind soils on north-facing slopes. The unit is about 5 percent Old Camp soils, 5 percent Yuko soils, and 5 percent Wedekind soils.

Permeability of this Koontz soil is moderately slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

The main limitation to use of this unit as sites for dwellings is the steepness of slope. The main limitations to use of this unit as septic tank absorption fields are the shallowness of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitation to the use of this unit as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the shallowness of the root zone over bedrock and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the shallowness of the root zone and the very low available water capacity. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Sufficient vegetation should be left to protect the unit from excessive erosion.

This soil is in capability subclass VIIs, nonirrigated.

990—Rock outcrop. Rock outcrop consists of exposed areas of hard bedrock, which commonly occur as peaks but can occur on rims of uplands. These areas do not support vegetation.

991—Xeric Torriorthents-Urban land complex. This complex is about 45 percent nearly level, well drained Xeric Torriorthents, 45 percent Urban land, and 10 percent included soils.

The Xeric Torriorthents portion of this unit consists of artificially filled areas of soil, trash, and rock. The soil characteristics are variable, but most of the material is more than 35 percent nonsoil fragments in a loamy matrix. In some areas, however, the matrix is clayey. Many of these areas are planted to lawns or to landscape plants.

The Urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification is not feasible.

Included in this unit are areas of unidentified soils and miscellaneous dumps. These areas make up about 10 percent of the unit.

This complex is used for residential, commercial, and other urban developments.

992—Playas. Playas consist of very deep, somewhat poorly drained and moderately well drained soils in nearly level, undrained basins. The soil materials are mostly clay, silty clay, and silty clay loam. Permeability is slow or very slow, and surface runoff is ponded. These soils have a slow intake rate and are covered with shallow water during periods of runoff. Depth to the seasonal high water table ranges from 2 to 6 feet. Salt concentrations vary considerably in these areas.

These areas are used as sites for recreation.

The areas are essentially barren of vegetation except for small patches of alkali weed that grow early in summer in some years. Because of ponding, slow permeability, and high salt content, use of this unit for agriculture is not feasible.

In general, ponding, seasonal high water table, slow permeability, and shrink-swell potential are limitations to use of these soils for all urban uses.

993—Haplaquolls, nearly level. These very deep, very poorly drained soils are on alluvial flood plains. They are wet and are periodically ponded. The soils are reworked, and the texture is highly variable. The soils have a dark surface layer. The vegetation varies from sparse to lush stands of sedges and rushes.

Included in this unit are small areas of aquents, Beaches, and intermittent lakes.

These soils produce food and cover for wetland wildlife. They are mostly used for wildlife habitat.

The seasonal high water table and the periodic ponding are severe limitations to both agricultural and urban uses.

994—Badland-Chalco-Verdico complex, 8 to 30 percent slopes. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 8 to 14 inches, the average annual air temperature is 47 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 40 percent Badland; 25 percent Chalco very stony clay loam, 15 to 30 percent slopes; and 20 percent Verdico extremely stony sandy loam, 8 to 15 percent slopes. Badland is on eroded side slopes. The Chalco soil is on rounded ridges and on side slopes of pediments. The Verdico soil is in shallow depressions on pediments. Areas of these soils are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this map unit are Stodick soils on ridges and hilltops, Reno soils on terrace remnants, and Northmore soils on alluvial fans. The unit is about 5 percent Stodick soils, 5 percent Reno soils, and 5 percent Northmore soils.

Badland consists of highly weathered water-laid tuff, diatomaceous earth, siltstone, and sandstone. It is dissected by intermittent drainage channels. It is essentially barren of vegetation. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Chalco soil is shallow and well drained. It formed in pedisediments derived from mixed rock sources.

Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is light brownish gray very stony clay loam about 3 inches thick. The subsoil is dark yellowish brown clay about 12 inches thick. Weathered bedrock is at a depth of 15 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

Permeability of the Chalco soil is very 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 slight.

The Verdico soil is moderately deep and well drained. It formed in alluvium from mixed rock sources.

Typically, 15 to 50 percent of the surface is covered with stones. The surface layer is grayish brown extremely stony sandy loam about 2 inches thick. The subsoil is brown clay about 27 inches thick. Weathered bedrock is at a depth of 29 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Verdico soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Chalco soil is mainly low sagebrush, Douglas rabbitbrush, and cheatgrass. The production of forage is limited by the low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the shallowness of the root zone.

The present vegetation in most areas of the Verdico soil is mainly low sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation, low available water capacity, high clay content, and restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the abrupt textural boundary.

Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

Roads on this unit are limited mainly by low load-bearing strength, high clay content, and steepness of slope. Suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

996—Dune land-Playas complex. This map unit is in enclosed basins in dry lakebeds. Elevation is 3,900 to 4,700 feet. The average annual precipitation is 4 to 8 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 100 to 120 days.

This unit is 65 percent Dune land, 4 to 50 percent slopes, and 20 percent Playas. Dune land is on ridges, and Playas are on the bottom of wide, windswept areas. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately.

Included in this map unit are Ruhe soils on higher terrace remnants, Isolde soils on stabilized sand dunes, and Trocken soils on alluvial fans. The unit is about 5 percent Ruhe soils, 5 percent Isolde soils, and 5 percent Trocken soils.

Dune land consists of various sizes of unstable sand dunes. The sand is well sorted, and it is mainly fine sand. Permeability is very rapid. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

Playas are very deep lake deposits. The texture is silty clay loam, silty clay, or clay. Permeability is very slow. Available water capacity is low, mainly because of the high salt content. Runoff is ponded, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The high hazard of soil blowing on Dune land is a severe limitation to most uses. During windy periods, blowing sand must be constantly cleared from all-weather roads. When winds are strong, visibility is zero.

997—Badland. Badland consists of highly weathered, water-laid tuff, diatomaceous earth, siltstone, and sandstone. It is dissected by intermittent drainage channels. It is essentially barren of vegetation. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Included in this unit are small areas of Chalco soils and Celeton Variant soils.

998—Beaches. Beaches are sandy, gravelly, or cobbly shores washed by the waves of Pyramid Lake. The areas may be partly covered with water during stormy periods.

1010—Gabica very gravelly sandy loam, 8 to 30 percent slopes. This shallow, well drained soil is on uplands. It formed in residuum derived from basalt or other basic igneous rocks. Elevation is 6,000 to 6,800 feet. The average annual precipitation is about 18 to 25 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 70 to 90 days.

Typically, 35 to 45 percent of the surface is covered with gravel. The surface layer is dark grayish brown very gravelly sandy loam about 14 inches thick. The subsoil is dark yellowish brown very cobbly clay loam about 5 inches thick. Hard, fractured bedrock is at a depth of 19 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Included in this unit are Rock outcrop as small peaks and ridges, Ticino soils near rims, and Jorge soils on concave north- or east-facing slopes. The unit is about 6 percent Rock outcrop, 5 percent Ticino soils, and 4 percent Jorge soils.

Permeability of this Gabica soil is moderately 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 slight.

This unit is used as rangeland.

The present vegetation in most areas is mainly low sagebrush, Douglas rabbitbrush, and muleears. Forage production is limited by the very low available water capacity, shallowness of the root zone over bedrock, the short growing season, and cold spring temperatures. The suitability of this soil for rangeland seeding is very poor because of the very low available water capacity of the surface layer and shallowness of the root zone.

Cold soil temperature delays plant growth and readiness for grazing. Grazing should be delayed until the soils are warm and the plants have achieved sufficient growth.

The main limitations to use of this unit as sites for roads are the steepness of slope and depth to bedrock. Deep cuts should be avoided because of the underlying bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

This soil is in capability subclass VIIs, nonirrigated.

1040—Orr Variant gravelly sandy loam. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 25 to 35 percent of the surface is covered with gravel. The surface layer is brown gravelly sandy loam about 18 inches thick. The subsoil is light yellowish brown sandy clay loam about 21 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown calcareous silty clay loam.

Included in this unit are Haybourne soils on higher alluvial fan skirts, Greenbrae soils on the lower parts of alluvial fans and on low terraces, and Aquinas soils on higher terrace remnants. The unit is about 5 percent Haybourne soils, 5 percent Greenbrae soils, and 5 percent Aquinas soils.

Permeability of this Orr Variant 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures that protect the soil from such floods are difficult to establish and maintain. The main limitation to use of the unit as septic tank absorption fields is the moderately slow permeability of the subsoil. This limitation can be overcome by increasing the size of the absorption field.

The susceptibility of this soil to frost heaving, high clay content, and flooding are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because of the moderately low precipitation. Grazing should be delayed

until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas to insure uniform grazing. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIc, irrigated, and VIc, nonirrigated.

1041—Orr Variant coarse sandy loam, thin surface. This deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is brown coarse sandy loam about 10 inches thick. The subsoil is light yellowish brown sandy clay loam about 21 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown calcareous silty clay loam.

Included in this unit are Aquinas soils on higher terrace remnants, Doten soils on lower terraces, and Lemm soils on inset alluvial fans. The unit is about 5 percent Aquinas soils, 5 percent Doten soils, and 5 percent Lemm soils.

Permeability of this Orr Variant 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the moderately slow permeability of the subsoil. This limitation can be overcome by increasing the size of the absorption field.

Flooding, the susceptibility of this soil to frost heaving, and the high clay content are moderate limitations to use of this unit as sites for roads. Drainage should be provided. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the moderately low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas to insure uniform grazing. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIc, irrigated and VIc, nonirrigated.

1050—Waspo clay, 15 to 30 percent slopes. This moderately deep, well drained soil is on pediments and uplands. It formed in residuum derived from tuffaceous materials. Elevation is 4,800 to 5,200 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 49 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is dark grayish brown clay about 7 inches thick. Below this is a buried surface layer of dark grayish brown clay about 17 inches thick. Gray, weathered tuff is at a depth of 24 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Included in this unit are Chalco soils on smooth tops; Reno soils on pediment remnants; and Manogue soils on slightly concave, less sloping areas. The unit is about 6 percent Chalco soils, 5 percent Reno soils, and 4 percent Manogue soils.

Permeability of this Waspo soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for rangeland.

The present vegetation in most areas is mainly Douglas rabbitbrush, big sagebrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation, low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is poor, mainly because of the steepness of slope. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion.

The main limitation to the use of this unit as sites for roads are the low load-bearing strength, steepness of slope, and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

This soil is in capability subclass VIIs, nonirrigated.

1051—Waspo stony clay, 30 to 50 percent slopes. This moderately deep, well drained soil is on pediments and uplands. It formed in residuum derived from tuffaceous materials. Elevation is 4,800 to 5,200 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 49 to 50

degrees F, and the average frost-free period is 100 to 110 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is dark grayish brown stony clay about 7 inches thick. Below this is a buried surface layer of dark grayish brown clay about 17 inches thick. Gray, weathered tuff is at a depth of 24 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Included in this unit are Chalco soils on the tops of pediments, Reno soils on pediment remnants, and Manogue soils on less sloping, slightly concave slopes. The unit is about 6 percent Chalco soils, 5 percent Reno soils, and 4 percent Manogue soils.

Permeability of this Waspo soil is very slow. Available water capacity is low. Effective rooting depth is 24 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for rangeland.

The present vegetation in most areas is mainly Douglas rabbitbrush, big sagebrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation, low available water capacity, and the restricted depth of the root zone over bedrock. This soil is rated as very poorly suited to rangeland seeding, mainly because of steepness of slope. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that sufficient vegetation is left to protect the soil from excessive erosion.

The main limitations to the use of this unit as sites for roads are the low load-bearing strength, steepness of slope, and high clay content. Suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

This soil is in capability subclass VIIe, nonirrigated.

1052—Waspo-Rock outcrop complex, 30 to 50 percent slopes. This map unit is on pediments and uplands. Elevation is 4,800 to 5,200 feet. The average annual precipitation is about 10 to 12 inches, the average air temperature is 49 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 60 percent Waspo stony clay, 30 to 50 percent slopes, and 25 percent Rock outcrop. The Waspo soil is on pediments and uplands. Rock outcrop is on narrow ridges and peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Chalco soils on tops of pediments and Reno soils on pediment remnants. Also included near Mogul is an area of Acrelane soils. The unit is about 8 percent Chalco soils and 7 percent Reno soils.

The Waspo soil is moderately deep and well drained. It formed in residuum derived from tuffaceous materials. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is dark grayish brown stony clay about 9 inches thick. The underlying material to a depth of 26 inches is dark grayish brown clay. Gray, weathered tuff is at a depth of 26 inches. Depth to weathered tuff ranges from 20 to 40 inches.

Permeability of the Waspo soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of andesite as narrow ridges or peaks.

This unit is used for urban development and as rangeland.

The main limitations to use of this unit as sites for dwellings are the steepness of slope and high clay content. The high clay content can cause high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and diverting water so that the soil near buildings is kept dry. The main limitations to use of this unit as septic tank absorption fields are the restricted depth of this soil over bedrock and the steepness of slope. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength, steepness of slope, and high clay content. Suitable material should be added to strengthen the base and provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly Douglas rabbitbrush, big sagebrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation, low available water capacity, and the restricted depth of the root zone over bedrock.

This soil is rated as very poorly suited to rangeland seeding, mainly because of steepness of slope. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that sufficient vegetation is left to protect the soil from excessive erosion.

This soil is in capability subclass VIIe, nonirrigated.

1054—Waspo gravelly clay, 2 to 8 percent slopes. This moderately deep, well drained soil is on pediments and uplands. It formed in residuum derived from tuffaceous materials. Elevation is 4,800 to 5,200 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 49 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is dark grayish brown gravelly clay about 6 inches thick. The underlying material to a depth of 23 inches is dark grayish brown clay. Gray, weathered tuff is at a depth of 23 inches. Depth to gray, weathered tuff ranges from 20 to 40 inches.

Included in this unit are Chalco soils on pediment tops, Reno soils on pediment remnants, and Manogue soils on slightly concave slopes. The unit is about 5 percent Chalco soils, 5 percent Reno soils, and 5 percent Manogue soils.

Permeability of this Waspo soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

The main limitation to use of this unit as sites for dwellings is high clay content. The high clay content can cause high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the restricted depth of this soil over bedrock. The soil above the bedrock is too thin to permit conventional design of absorption fields. Inadequately filtered effluent can surface downslope or seep through cracks of the rock into the ground water. Increasing the volume of soil used for filtering can minimize these limitations. If the density of housing is too high, however, community sewage systems are needed.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, Douglas rabbitbrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation, low available water capacity, and the root zone restriction of the bedrock. The suitability of this soil for rangeland seeding is fair. The main limitations for seeding are the moderately low precipitation and the restricted depth of the root zone over bedrock. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

1060—Witefels-Rock outcrop complex, 15 to 30 percent slopes. This map unit is on mountainous uplands. Elevation is 7,500 to 9,500 feet. The average annual precipitation is about 40 inches, the average annual air temperature is 39 to 40 degrees F, and the average frost-free period is less than 80 days.

This unit is 70 percent Witefels coarse sand, 15 to 30 percent slopes, and 20 percent Rock outcrop. The Witefels soil is on side slopes. Rock outcrop is on peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Temo soils near ridges and peaks and Graylock soils on lower colluvial slopes. Also included are areas that are wet in spring. The unit is about 4 percent Temo soils, 3 percent Graylock soils, and 3 percent areas that are wet in spring.

The Witefels soil is moderately deep and somewhat excessively drained. It formed in residuum derived mainly from granitic rock. The surface layer is grayish brown coarse sand about 8 inches thick. The underlying material to a depth of 35 inches is pale brown gravelly coarse sand. Weathered bedrock is at a depth of 35 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Witefels soil is rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of granitic rock.

This unit is used as woodland.

The present vegetation on the Witefels soil is mainly Jeffrey pine and white fir with an understory of pinemat manzanita, snowbrush ceanothus, and squawcarpet. This soil is suited to Jeffrey pine, white fir, and California red fir. If planted to Jeffrey pine, the soil can produce about 1,960 cubic feet, or 7,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. The sandy texture of the soil imposes some limitations on the use of equipment and creates a severe hazard of erosion. Stones on the surface and the presence of Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment. Management that minimizes the risk of erosion during harvesting is essential.

The main limitation to the use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soil in this unit is in capability subclass VIIs, nonirrigated.

1062—Witefels-Rock outcrop complex, 50 to 70 percent slopes. This map unit is on mountainous uplands. Elevation is 7,500 to 9,500 feet. The average annual precipitation is about 40 inches, the average annual air temperature is 39 to 40 degrees F, and the average frost-free period is less than 80 days.

This unit is 70 percent Witefels coarse sand, 50 to 70 percent slopes, and 20 percent Rock outcrop. The Witefels soil is on side slopes and Rock outcrop is on peaks and ridges. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Temo soils near ridges and peaks and Graylock soils on lower colluvial slopes. The unit is about 4 percent Temo soils and 3 percent Graylock soils. Also included is a soil that occurs in snow pockets and is wet in spring. This soil makes up about 3 percent of the unit.

The Witefels soil is moderately deep and somewhat excessively drained. It formed in residuum derived mainly from granitic rocks. The surface layer is grayish brown coarse sand about 8 inches thick. The underlying material to a depth of 35 inches is pale brown gravelly coarse sand. Weathered bedrock is at a depth of 35 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Witefels soil is rapid. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of granitic rock.

This unit is used for woodland.

The present vegetation on the Witefels soil is mainly Jeffrey pine and white fir with an understory of pinemat manzanita, snowbrush ceanothus, and squawcarpet. This soil is suited to Jeffrey pine, white fir, and California red fir. If planted to Jeffrey pine, it can produce about 1,960 cubic feet, or 7,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The sandy texture of the soil and the steepness of slope limit some equipment use and create an erosion hazard. Management that minimizes the risk of erosion during harvesting is essential. Stones on the surface and the Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment.

Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soil in this unit is in capability subclass VIIs, nonirrigated.

1080—Inville Variant gravelly sandy loam, 2 to 8 percent slopes. This very deep, somewhat poorly drained soil is on terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 6,000 to 7,400 feet. The average annual precipitation is 20 to 30 inches, the average annual air temperature is 41 to 45 degrees F, and the average frost-free period is 50 to 80 days.

Typically, 15 to 35 percent of the surface is covered with gravel. The surface layer is brown gravelly sandy loam about 8 inches thick. The subsoil is dark brown very gravelly loam about 17 inches thick. The substratum to a depth is 78 inches is strong brown gravelly sandy clay loam with many mottles.

Included in this unit are Blackwell soils on flood plains, Jorge soils on foot slopes of uplands, and Apmat soils on higher-lying alluvial fans. The unit is about 5 percent Blackwell soils, 5 percent Jorge soils, and 5 percent Apmat soils.

Permeability of this Inville Variant soil is moderately slow. Available water capacity is moderate. Effective rooting depth is more than 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. The seasonal high water table is at a depth of 30 to 40 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity or during periods of high snowmelt. Channeling and deposition are common along streambanks.

This unit is used as woodland.

The present vegetation in most areas is mainly lodgepole pine with an understory of snowbrush ceanothus and arrowleaf balsamroot. If planted to lodgepole pine, the soil can produce about 3,860 cubic feet, or 15,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. This soil is wet in spring. Management operations should be conducted during the drier seasons.

The main limitation to use of this unit as sites for roads is the susceptibility of this soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

This soil is in capability subclass VIw, nonirrigated.

1090—Railcity very bouldery coarse sand, 15 to 50 percent slopes. This very deep, somewhat excessively drained soil is on old landslides. It formed in colluvium derived dominantly from granitic rocks. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 12 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 50 to 100 days.

Typically, 3 to 15 percent of the surface is covered with boulders. The surface layer is grayish brown very bouldery coarse sand about 6 inches thick. The

underlying material to a depth of 60 inches is yellowish brown very gravelly coarse sand through sandy loam.

Included in this unit are Apmat soils on alluvial fans; Temo soils on high ridge remnants; Corbett soils on higher, smooth, east- and north-facing slopes; and Rock outcrop as peaks. The unit is about 4 percent Apmat soils, 4 percent Temo soils, 4 percent Corbett soils, and 3 percent Rock outcrop.

Permeability of this Railcity soil is 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 for woodland.

The present vegetation in most areas is mainly Jeffrey pine with an understory of manzanita, antelope bitterbrush, and big sagebrush. This soil is suited to Jeffrey pine. If it is planted to Jeffrey pine, the soil can produce about 4,270 cubic feet, or 19,700 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. Management that minimizes the risk of erosion during harvesting timber is essential. Stones on the surface and the presence of Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment. The steepness of slope limits the kinds of equipment that can be used in forest management.

The main limitation to the use of this soil as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

This soil is in capability subclass VIIs, nonirrigated.

1091—Railcity very bouldery coarse sand, 8 to 15 percent slopes. This very deep, somewhat excessively drained soil is on old landslides. It formed in colluvium derived dominantly from granitic rocks. Elevation is 5,050 to 6,000 feet. The average annual precipitation is 12 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 50 to 100 days.

Typically, 3 to 15 percent of the surface is covered with boulders. The surface layer is grayish brown very bouldery coarse sand about 6 inches thick. The underlying material to a depth of 60 inches is yellowish brown, stratified very gravelly coarse sand through sandy loam.

Included in this unit are Apmat soils on alluvial fans; Temo soils on high ridge remnants; Corbett soils on higher, smooth slopes; and Rock outcrop, which occurs as peaks. The unit is about 4 percent Apmat soils, 4 percent Temo soils, 4 percent Corbett soils, and 3 percent Rock outcrop.

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

This unit is used as woodland.

The present vegetation in most areas is mainly Jeffrey pine with an understory of antelope bitterbrush, big sagebrush, and manzanita. This soil is suited to Jeffrey pine. If it is planted to Jeffrey pine, the soil can produce about 4,270 cubic feet, or 19,700 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. Stones on the surface and the presence of Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

The main limitation to use of this soil as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

This soil is in capability subclass VIIs, nonirrigated.

1100—Graylock-Temo-Rock outcrop complex, 30 to 70 percent slopes. This map unit is on mountainous uplands. Elevation is 6,500 to 9,000 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 39 to 41 degrees F, and the average frost-free period is less than 80 days.

This unit is 50 percent Graylock bouldery loamy sand, 30 to 70 percent slopes; 25 percent Temo bouldery coarse sand, 30 to 50 percent slopes; and 10 percent Rock outcrop. The Graylock soil is on side slopes of uplands, the Temo soil is on ridges, and Rock outcrop is on peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Witefels soils on smooth slopes at higher elevations; Corbett soils on smooth slopes at lower elevations; and Toiyabe soils on lower, south-facing ridges. The unit is about 5 percent Witefels soils, 5 percent Corbett soils, and 5 percent Toiyabe soils.

The Graylock soil is deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rock. Typically, 1 to 3 percent of the surface is covered with boulders. The surface is grayish brown bouldery loamy sand about 10 inches thick. The underlying material to a depth of 60 inches is pale brown very gravelly loamy sand. Fractured bedrock is at a depth of 60 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Graylock soil is rapid. Available water capacity is low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Temo soil is shallow and excessively drained. It formed in residuum derived dominantly from granitic rock. Typically, 1 to 3 percent of the surface is covered

with boulders. The surface layer is grayish brown bouldery coarse sand about 10 inches thick. The underlying material to a depth of 16 inches is pale brown gravelly loamy coarse sand. Granitic gruss is at a depth of 16 inches. Depth to bedrock ranges from 8 to 20 inches.

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

Rock outcrop consists of exposed areas of granitic rock as peaks or ridges.

This unit is used as woodland.

The present vegetation in most areas of the Graylock soil is mainly lodgepole pine and whitebark pine with an understory of big sagebrush, lupine, and muleears. If planted to California red fir, the soil can produce about 9,350 cubic feet, or 55,100 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The present vegetation in most areas of the Temo soil is mainly Jeffrey pine, white fir, and California red fir with an understory of pinemat manzanita, squawcarpet, and snowbrush ceanothus. This soil is suited to white fir and California red fir. If it is planted to white fir or California red fir, the soil can produce about 9,350 cubic feet, or 55,100 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

Stones on the surface and the presence of Rock outcrop can interfere with felling, yarding, and other operations involving the use of equipment. The sandy texture of the soil imposes some limitations on the use of equipment and creates a hazard of erosion. Management that minimizes the risk of erosion is essential when harvesting timber.

The main limitation to the use of this unit as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Graylock soil is in capability subclass VIIs, nonirrigated. The Temo soil is in capability subclass VIIe, nonirrigated.

1120—Apmat very stony coarse sand, 2 to 8 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in glacial outwash and till derived mainly from volcanic rocks. Elevation is 5,400 to 7,000 feet. The average annual precipitation is about 20 to 35 inches, the average annual air temperature is 41 to 44 degrees F, and the average frost-free period is 50 to 80 days.

Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony coarse sand about 10 inches thick. The subsurface layer is light brownish gray very gravelly loamy sand about 11 inches thick. The subsoil is yellowish brown very stony sandy loam about 34 inches thick. The substratum to a depth of 60 inches is extremely bouldery loamy coarse sand.

Included in this unit are Oest soils on terraces and alluvial fans at lower elevations, Notus soils near streams, Jumbo soils on colluvial slopes of uplands, and Fraval soils on uplands. The unit is about 4 percent Oest soils, 3 percent Notus soils, 4 percent Jumbo soils, and 4 percent Fraval soils.

Permeability of this Apmat soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is low. Effective rooting depth is more than 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as woodland.

Stoniness is a moderate limitation to use of this unit as sites for dwellings. Heavy equipment is needed to excavate the large stones. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

The susceptibility of this soil to frost heaving and stoniness are moderate limitations to use of this unit as sites for roads. Suitable material should be added to provide an adequate surface. Drainage should be provided.

The present vegetation in most areas is mainly Jeffrey pine with an understory of antelope bitterbrush, big sagebrush, and squawcarpet. In harvested or burned areas, the vegetation is dominantly understory plants. If planted to Jeffrey pine, the soil can produce about 2,800 cubic feet, or 11,900 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

This soil is in capability subclass VIIs, nonirrigated.

1121—Apmat gravelly sandy loam, 2 to 8 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in glacial outwash and till derived mainly from volcanic rocks. Elevation is 5,900 to 7,500 feet. The average annual precipitation is about 20 to 35 inches, the average annual air temperature is 41 to 44 degrees F, and the average frost-free period is 50 to 80 days.

Typically, 3 to 15 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly

sandy loam about 10 inches thick. The subsurface layer is light brownish gray very gravelly loamy sand about 11 inches thick. The subsoil is yellowish brown very stony sandy loam about 34 inches thick. The substratum to a depth of 60 inches is extremely bouldery loamy coarse sand.

Included in this unit are Oest soils on terraces and alluvial fans at lower elevations, Inville Variant soils near streams, Jumbo soils on colluvial slopes of uplands, and Fraval soils on remnant ridges of uplands. The unit is about 4 percent Oest soils, 3 percent Inville Variant, 4 percent Jumbo soils, and 4 percent Fraval soils.

Permeability of this Apmat soil is moderately rapid. Available water capacity is low. Effective rooting depth is more than 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used as woodland.

The present vegetation is mainly Jeffrey pine with an understory of antelope bitterbrush, big sagebrush, and squawcarpet. This soil is suited to Jeffrey pine. If it is planted to Jeffrey pine, the soil can produce about 2,800 cubic feet, or 11,900 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The susceptibility of this soil to frost heaving and the stones are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

This soil is in capability subclass VIIs, nonirrigated.

1130—Dithod sandy loam. This very deep soil with altered drainage is on flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,350 to 4,500 feet. The average annual precipitation is about 6 to 8 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 15 inches thick. The lower part to a depth of 60 inches is stratified loamy fine sand to clay loam.

Included in this unit are Voltaire soils on lower, slightly concave parts of flood plains; Vamp soils on slightly higher terrace remnants; and Rose Creek soils near the upper parts of stream channels. The unit is about 5 percent Voltaire soils, 5 percent Vamp soils, and 5 percent Rose Creek soils.

Permeability of this Dithod soil is moderately slow. Available water capacity is high. Effective rooting depth is more than 60 inches. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. The seasonal high water table is at a depth of 48 to 72 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity.

This unit is used for urban development, crops, pasture, and hay.

Flooding is a limitation to use of this unit as sites for dwellings. This soil is subject to seasonal flooding that can be controlled only by major flood control structures. The main limitations to use of this unit as septic tank absorption fields are the high water table and the moderately slow permeability of the subsoil. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

Flooding, the susceptibility of this soil to frost heaving, and the high clay content are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

If this unit is used for irrigated crops, the main limitation is the high water table. Under good management including a conservation cropping system, this soil can produce yields of 4 tons per acre of alfalfa, 60 bushels per acre of barley, or 70 bushels per acre of spring wheat. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

If this unit is used for hay and pasture, the main limitation is the high water table. Shallow-rooted, water-tolerant plants are suited to this soil. The present vegetation is mainly grass. Under a good pasture or hayland management system, this unit can produce yields of 4 tons per acre of alfalfa or 8 animal-unit-months per acre of pasture. Irrigation water must be carefully applied to avoid raising the water table.

This soil is in capability subclasses IIw, irrigated, and VIw, nonirrigated.

1141—Bedell loamy sand, 2 to 4 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived mainly from granitic rock. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is brown loamy sand about 15 inches thick. The subsoil is yellowish brown sandy loam about 39 inches thick. The substratum to a depth of 60 inches is yellowish brown loamy coarse sand.

Included in this unit are Linhart soils on inset alluvial fans, Orr soils on higher terrace remnants, and Wedertz soils on toe slopes of alluvial fans. The unit is about 5 percent Linhart soils, 5 percent Orr soils, and 5 percent Wedertz soils.

Permeability of this Bedell soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity of the soil is low. Effective rooting depth is more than 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

Flooding and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, Anderson peachbrush, and Indian ricegrass. The production of forage is limited by the moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas to insure uniform grazing. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIe, irrigated, and VIIs, nonirrigated.

1142—Bedell loamy sand, 4 to 8 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived mainly from granitic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is brown loamy sand about 15 inches thick. The subsoil is yellowish brown sandy loam about 39 inches thick. The lower part to a depth of 60 inches is yellowish brown loamy coarse sand.

Included in this unit are Linhart soils on inset alluvial fans, Orr soils on higher terrace remnants, and Wedertz soils on the toe slopes of alluvial fans. The unit is about 5 percent Linhart soils, 5 percent Orr soils, and 5 percent Wedertz soils.

Permeability of this Bedell soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity of the soil is low. Effective rooting depth is more than 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain.

The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

Flooding and susceptibility to frost heaving are moderate limitations to the use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, Anderson peachbrush, and Indian ricegrass. The production of forage is limited by the moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, because of the low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIIe, irrigated, and VIIs, nonirrigated.

1143—Bedell loamy sand, 8 to 15 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived mainly from granitic rocks. Elevation is 4,500 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the

average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is brown loamy sand about 14 inches thick. The subsoil is yellowish brown sandy loam about 36 inches thick. The substratum to a depth of 60 inches is yellowish brown loamy coarse sand.

Included in this unit are Linhart soils on inset alluvial fans, Orr soils on higher terrace remnants, and Wedertz soils on toe slopes of the alluvial fans. The unit is about 5 percent Linhart soils, 5 percent Orr soils, and 5 percent Wedertz soils.

Permeability of this Bedell soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity of the soil is low. Effective rooting depth is more than 60 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the rapidly permeable substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

Steepness of slope, flooding, and the susceptibility of this soil to frost heaving are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, Anderson peachbrush, and Indian ricegrass. The production of forage is limited by the moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVe, irrigated, and VIIs, nonirrigated.

1160—Jowec silty clay loam. This very deep, well drained soil is on low lake terraces. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,800 to 5,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temprature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is light brownish gray silty clay loam about 2 inches thick. The subsoil is dark yellowish brown clay loam about 18 inches thick. The upper part of the substratum is clay loam about 18 inches thick, and the lower part to a depth of 60 inches is stratified loam and sandy loam.

Included in this unit are Mellor soils on lower terraces; Turria soils, which are near drainageways and are subject to occasional flooding; and Haybourne soils on higher alluvial fan skirts. The unit is about 5 percent Mellor soils, 5 percent Turria soils, and 5 percent Haybourne soils.

Permeability of this Jowec soil is slow. Available water capacity is high. Effective rooting depth is more than 60 inches. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. This soil is subject to shallow flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland.

Flooding and the high clay content of this soil are limitations to use of this soil as sites for dwellings. The high clay content can result in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field. Percolation can also be improved in some areas by placing the leach line below the least permeable layer.

The main limitations to use of this unit as sites for roads are the low load-bearing strength and high clay content. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush and spiny hopsage. The production of forage is limited by the low precipitation and high clay content. The suitability of this soil for rangeland seeding is very poor, mainly because of the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

1161—Jowec sandy loam. This very deep, well drained soil is on low lake terraces. It formed in alluvium derived from mixed rock sources. Slopes are 2 to 4 percent. Elevation is 4,800 to 5,600 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is light brownish gray sandy loam about 2 inches thick. The subsoil is dark yellowish brown clay about 18 inches thick. The upper part of the substratum is clay loam about 18 inches thick, and the lower part to a depth of 60 inches is stratified loam and sandy loam.

Included in this unit are Mellor soils on lower terraces; Turria soils, which occur near drainageways and are subject to occasional flooding; and Haybourne soils on higher alluvial fan skirts. The unit is about 5 percent Mellor soils, 5 percent Turria soils, and 5 percent Haybourne soils.

Permeability of this Jowec soil is slow. Available water capacity is high. Effective rooting depth is more than 60 inches. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. This soil is subject to shallow flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland.

Flooding and the high clay content of this soil are limitations to use of this unit as sites for dwellings. The high clay content results in high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this unit as septic tank absorption fields is the slow permeability in the subsoil and upper part of the substratum. This limitation can be overcome by increasing the size of the absorption field. Percolation can also be improved in some areas by placing the leach line below the least permeable layer.

The high clay content and low load-bearing strength are the main limitations for roads. Suitable material should be added to strengthen the base and provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by the low precipitation and high clay content. The suitability of this soil for rangeland seeding is very poor, mainly because of the abrupt textural boundary. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIIs, nonirrigated.

1170—Wedertz sandy loam, 2 to 4 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown sandy loam about 6 inches thick. The subsoil is brown sandy clay loam about 16 inches thick. The upper 12 inches of the substratum is pale brown, weakly cemented sandy loam. The lower part to a depth of 60 inches is pale brown gravelly loamy sand. Depth to weak silica cementation ranges from 20 to 35 inches.

Included in this unit are Aquinas soils on higher terrace remnants, Greenbrae soils near the ends of alluvial fans and on lower terraces, and Jowec soils in shallow depressions of lower terraces. The unit is about 5 percent Aquinas soils, 5 percent Greenbrae soils, and 5 percent Jowec soils.

Permeability of this Wedertz soil is moderately slow in the subsoil and upper part of the substratum and rapid in the lower part of the substratum. Available water capacity of the soil 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 slight. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this soil as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitations to use of this unit as septic tank absorption fields are the moderately slow permeability in the subsoil and upper part of the substratum and the rapid permeability in the lower part of the substratum. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. The leach lines should not be placed into the rapidly permeable part of the substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Flooding, the susceptibility of this soil to frost heaving, and high clay content are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, littleleaf horsebrush, and Indian ricegrass. The production of forage is limited by the low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the low precipitation and the very low available water capacity of the surface

layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIe, irrigated, and VIc, nonirrigated.

1171—Wedertz sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown sandy loam about 8 inches thick. The subsoil is brown sandy clay loam about 23 inches thick. The upper 7 inches of the substratum is pale brown, weakly cemented sandy loam. The lower part to a depth of 60 inches is pale brown gravelly loamy sand. Depth to the weakly cemented layer ranges from 20 to 35 inches.

Included in this unit are Indian Creek soils on higher terrace remnants, Greenbrae soils on lower parts of alluvial fans, Linhart soils near the upper parts of drainageways, and Jowec soils in shallow depressions. The unit is about 5 percent Indian Creek soils, 5 percent Greenbrae soils, 3 percent Linhart soils, and 2 percent Jowec soils.

Permeability of this Wedertz soil is moderately slow in the subsoil and upper 7 inches of the substratum and rapid in the lower part of the substratum. Available water capacity of the soil is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitations to use of this unit as septic tank absorption fields are the moderately slow permeability in the subsoil and upper part of the substratum and the rapid permeability in the lower part of the substratum. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. The leach lines should not be placed into the rapidly permeable part of the substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Flooding, the susceptibility of this soil to frost heaving, and the high clay content are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, littleleaf horsebrush, and Indian ricegrass. The production of forage is limited by the low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because of the low precipitation and the low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIIe, irrigated, and VIc, nonirrigated.

1172—Wedertz sand, 2 to 4 percent slopes. This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is pale brown sand about 7 inches thick. The subsoil is brown sandy clay loam about 18 inches thick. The upper 6 inches of the substratum is pale brown, weakly cemented sandy loam. The lower part to a depth of 60 inches is pale brown gravelly loamy sand. Depth to weak cementation ranges from 20 to 35 inches.

Included in this unit are Aquinas soils on higher terrace remnants, Greenbrae soils on lower parts of alluvial fans and on lower terraces, and Turria soils on inset alluvial fans. The unit is about 5 percent Aquinas soils, 5 percent Greenbrae soils, and 5 percent Turria soils.

Permeability of this Wedertz soil is moderately slow in the subsoil and upper part of the substratum and rapid in the lower part. Available water capacity of the soil 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 flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures to protect the soil from such floods are difficult to establish and maintain. The main limitations to use of this unit as septic tank absorption fields are the moderately slow permeability of the subsoil and upper part of the substratum and the rapid permeability in the lower part of the substratum. The limitation imposed by moderately

slow permeability can be overcome by increasing the size of the absorption field. The leach lines should not be placed in the rapidly permeable part of the substratum. Because the substratum is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Flooding, the susceptibility of this soil to frost heaving, and the high clay content are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly big sagebrush, littleleaf horsebrush, and Indian ricegrass. The production of forage is limited by the low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

This soil is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated.

1181—Haypress-Tanob-Rock outcrop complex, 15 to 50 percent slopes. This map unit is on uplands. Elevation is 5,700 to 7,500 feet. The average annual precipitation is about 14 to 16 inches, the average annual air temperature is 42 to 47 degrees F, and the average frost-free period is 50 to 65 days.

This unit is 50 percent Haypress very bouldery loamy coarse sand, 15 to 50 percent slopes; 30 percent Tanob gravelly loamy coarse sand, 15 to 30 percent slopes; and 10 percent Rock outcrop. The Haypress soil is on convex side slopes of uplands. The Tanob soil is on saddles and on smooth to slightly concave slopes. Rock outcrop is on peaks. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Railcity soils on colluvial slopes, Acrelane soils on rounded ridges at lower elevations, and Linhart soils on lower canyon bottoms and on lower colluvial slopes. The unit is about 4 percent Railcity soils, 3 percent Acrelane soils, and 3 percent Linhart soils.

The Haypress soil is deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rock. Typically, 3 to 10 percent of the surface is covered with boulders. The surface layer is dark grayish brown very bouldery loamy coarse sand about 15 inches thick. The underlying material to a depth of 46 inches is brown gravelly loamy coarse sand. Weathered bedrock is at a depth of 46 inches. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Haypress soil is rapid. Available water capacity of the soil is very low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Tanob soil is moderately deep and well drained. It formed in residuum derived dominantly from granitic rock. Typically, the surface layer is dark grayish brown gravelly loamy coarse sand about 17 inches thick. The subsoil is light yellowish brown sandy loam about 11 inches thick. Weathered bedrock is at a depth of 28 inches. Depth to weathered bedrock ranges from 20 to 30 inches.

Permeability of the Tanob soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of granitic rock as small peaks and ridges.

This unit is used as rangeland.

In most areas of the Haypress soil, the present vegetation is mainly big sagebrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by the very low available water capacity, the short growing season, and cold temperature in spring. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and steepness of slope.

In most areas of the Tanob soil, the present vegetation is mainly big sagebrush, antelope bitterbrush, and snowberry. The production of forage is limited by the short growing season, the cold temperature in spring, the very low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion. Cold soil temperatures delay plant growth and readiness for grazing. Therefore, grazing should be delayed until the soils are warm and the plants have achieved sufficient growth.

The main limitation to use of this unit as sites for roads is the steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Haypress soil is in capability subclass VIIs, nonirrigated. The Tanob soil is in capability subclass VIIe, nonirrigated.

182—Haypress-Tanob-Rock outcrop association. This map unit is on uplands. Elevation is 5,700 to 7,500 feet. The average annual precipitation is about 14 to 16 inches, the average annual air temperature is 42 to 47

degrees F, and the average frost-free period is 50 to 65 days.

This unit is 60 percent Haypress extremely bouldery loamy coarse sand, 30 to 70 percent slopes; 20 percent Tanob gravelly loamy coarse sand, 8 to 30 percent slopes; and 10 percent Rock outcrop. The Haypress soil is on steep, slightly convex side slopes. The Tanob soil is on saddles between peaks and on smooth, less sloping areas. Rock outcrop is on peaks.

Included in this unit are Toiyabe soils near Rock outcrop, Flex soils on the lower slopes along the contact with altered andesite and metamorphic rock, and Graufels soils on lower south-facing slopes. The unit is about 5 percent Toiyabe soils, 3 percent Flex soils, and 2 percent Graufels soils.

The Haypress soil is deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rock. Typically, 10 to 15 percent of the surface is covered with boulders. The surface layer is dark grayish brown extremely bouldery loamy coarse sand about 15 inches thick. The underlying material to a depth of 40 inches is brown gravelly coarse sand. Weathered bedrock is at a depth of 40 inches. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Haypress soil is rapid. Available water capacity is very low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Tanob soil is moderately deep and well drained. It formed in residuum derived dominantly from granitic rock. Typically, the surface layer is dark brown gravelly loamy coarse sand about 17 inches thick. The subsoil is light yellowish brown sandy loam about 11 inches thick. Weathered bedrock is at a depth of 28 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Tanob soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of granitic rock as peaks and ridges.

This unit is used as rangeland.

The present vegetation in most areas of the Haypress soil is mainly big sagebrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by the very low available water capacity, the short growing season, and the cold temperature in spring. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, steepness of slope, and large stones on the surface.

The present vegetation in most areas of the Tanob soil is mainly big sagebrush, antelope bitterbrush, and snowberry. The production of forage is limited by the short growing season, cold temperature in spring, very low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that sufficient vegetation is left to protect the unit from excessive erosion. Cold soil temperatures delay plant growth and readiness for grazing. Grazing should be delayed until the soils are warm and the plants have achieved sufficient growth.

The main limitations to use of this unit as sites for roads are steepness of slope of both soils and stones in the Haypress soil. Suitable material should be added to provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Haypress soil is in capability subclass VIIs, nonirrigated. The Tanob soil is in capability subclass VIIe, nonirrigated.

1183—Haypress-Rock outcrop complex, 15 to 50 percent slopes. This map unit is on uplands. Elevation is 5,700 to 7,500 feet. The average annual precipitation is about 14 to 16 inches, the average annual air temperature is 42 to 47 degrees F, and the average frost-free period is 50 to 65 days.

This unit is about 60 percent Haypress very bouldery loamy coarse sand, 15 to 50 percent slopes, and about 25 percent Rock outcrop. The Haypress soil is near ridges and on steep side slopes, and Rock outcrop is on peaks and ridges.

Included in this unit are Toiyabe soils near the Rock outcrop; Acrelane soils on lower, south-facing slopes; and Graufels soils on lower colluvial slopes. The unit is about 5 percent Toiyabe soils, 5 percent Acrelane soils, and 5 percent Graufels soils.

The Haypress soil is deep and somewhat excessively drained. It formed in residuum derived dominantly from granitic rock. Typically, 10 to 15 percent of the surface is covered with boulders. The surface layer is dark grayish brown very bouldery loamy coarse sand about 14 inches thick. The underlying material to a depth of 49 inches is brown gravelly coarse sand. Weathered bedrock is at a depth of 49 inches. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Haypress soil is rapid. Available water capacity is very low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of granitic rock as peaks and ridges.

This unit is used as rangeland.

The present vegetation in most areas of the Haypress soil is mainly big sagebrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by the very low available water capacity, the short growing season, and cold temperature in spring. The suitability of this soil for rangeland seeding is very poor, mainly

because of the very low available water capacity of the surface layer and steepness of slope.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Cold soil temperature delays plant growth and readiness for grazing. Therefore, grazing should be delayed until the soils are warm and the plants have achieved sufficient growth.

The main limitation to use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

This complex is in capability subclass VIIs, nonirrigated.

1190—Spasprey sandy loam, 0 to 2 percent slopes. This moderately deep, well drained soil is on lake terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 2 inches thick. The subsoil is brown clay loam about 10 inches thick. The upper 17 inches of the substratum is light brownish gray sandy loam; the next 17 inches is a pale brown, strongly cemented hardpan; and the lower part to a depth of 60 inches is pale brown sandy loam with varying degrees of cementation. Depth to the hardpan ranges from 20 to 30 inches.

Included in this unit are Mellor soils on low terraces, Haybourne soils on inset alluvial fans, and Indian Creek soils on higher terrace remnants. The unit is about 5 percent Mellor soils, 5 percent Haybourne soils, and 5 percent Indian Creek soils.

Permeability of this Spasprey soil is moderately slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for urban development and crops and as rangeland.

This soil is well suited to use as sites for the construction of dwellings. The main limitation to use of this unit as septic tank absorption fields is the hardpan. The suitability of the soil for use as septic tank absorption fields can be improved by ripping the hardpan.

The susceptibility of this soil to frost heaving is a moderate limitation to the use of this unit as sites for roads. Drainage should be provided.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and Douglas rabbitbrush. The production of forage is limited by the very low available water capacity, low precipitation, and the restricted depth of the root zone over the hardpan. The suitability of this soil for rangeland seeding is poor, mainly because of the low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

If this unit is used for irrigated crops, the main limitations are the restricted depth of the root zone over the hardpan and the very low available water capacity. Under good management including a conservation cropping system, this soil can produce yields of 3 tons per acre of alfalfa, 42 bushels per acre of barley, or 62.5 bushels per acre of oats. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating. Overirrigating results in the formation of a perched water table.

The soils in this unit are in capability subclasses IIIs, irrigated, and VIs, nonirrigated.

1191—Spasprey sandy loam, 2 to 4 percent slopes. This moderately deep, well drained soil is on lake terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 2 inches thick. The subsoil is brown clay loam about 10 inches thick. The upper 17 inches of the substratum is light brownish gray sandy loam, the next 17 inches is a pale brown strongly cemented hardpan, and the lower part to a depth of 60 inches is pale brown sandy loam with varying degrees of cementation. Depth to the hardpan ranges from 20 to 30 inches.

Included in this unit are Mellor soils on low terraces, Haybourne soils on inset alluvial fans, and Indian Creek soils on higher terrace remnants. The unit is about 5 percent Mellor soils, 5 percent Haybourne soils, and 5 percent Indian Creek soils.

Permeability of this Spasprey soil is moderately slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for urban development and crops and as rangeland.

This soil is well suited to use as sites for dwellings. The main limitation to use of this unit as septic tank absorption fields is the hardpan. The suitability of the soil for use as septic tank absorption fields can be improved by ripping the hardpan.

The susceptibility of this soil to frost heaving is a moderate limitation to use of the unit as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and Douglas rabbitbrush. The production of forage is limited by the very low available water capacity, low precipitation, and the restricted depth of the root zone over the hardpan. This soil is rated as poorly suited to rangeland seeding, mainly because of the low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

If this unit is used for irrigated crops, the main limitations are the restricted depth of the root zone over the hardpan and the very low available water capacity. Under good management including a conservation cropping system, this soil can produce yields of 3 tons per acre of alfalfa, 42 bushels per acre of barley, or 62.5 bushels per acre of oats. Applications of irrigation water should be adjusted to the available water capacity, the water intake, and the crop needs to avoid overirrigating. Overirrigating results in the formation of a perched water table. Care must be taken to prevent erosion.

This soil is in capability subclasses IIIe, irrigated, and VIs, nonirrigated.

1192—Spasprey sand, 2 to 4 percent slopes. This moderately deep, well drained soil is on lake terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sand about 6 inches thick. The subsoil is brown clay loam about 8 inches thick. The upper 16 inches of the substratum is light brownish gray sandy loam, the next 17 inches is a pale brown strongly cemented hardpan, and the lower part to a depth of 60 inches is pale brown sandy loam with varying degrees of cementation. Depth to the hardpan ranges from 20 to 30 inches.

Included in this unit are Mellor soils on low terraces, Haybourne soils on inset alluvial fans, and Indian Creek soils on higher terrace remnants. The unit is about 5 percent Mellor soils, 5 percent Haybourne soils, and 5 percent Indian Creek soils.

Permeability of this Spasprey soil is moderately slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for urban development and crops and as rangeland.

This soil is well suited to use as sites for dwellings. The main limitation to use of this unit as septic tank absorption fields is the hardpan. The suitability of the soil for septic tank absorption fields can be improved by ripping the hardpan.

The susceptibility of this soil to frost heaving is a moderate limitation to use of this unit as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and cheatgrass. The production of forage is limited by the low precipitation, very low available water capacity, and the restricted depth of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

If this unit is used for irrigated crops, the main limitations are the restricted depth of the root zone over the hardpan and the very low available water capacity. Under good management including a conservation cropping system, this soil can produce yields of 2.5 tons per acre of alfalfa, 32 bushels per acre of barley, or 47 bushels per acre of oats. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating. Overirrigating results in the formation of a perched water table.

This soil is in capability subclasses IVs, irrigated, and VIIs, nonirrigated.

1193—Spasprey sandy loam, 4 to 8 percent slopes. This moderately deep, well drained soil is on lake terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, the surface layer is grayish brown sandy loam about 2 inches thick. The subsoil is brown clay loam about 10 inches thick. The upper 17 inches of the substratum is light brownish gray sandy loam, the next 17 inches is a pale brown strongly cemented hardpan, and the lower part to a depth of 60 inches is pale brown sandy loam with varying degrees of cementation. Depth to the hardpan ranges from 20 to 30 inches.

Included in this unit are Jowec Variant soils on lower terraces, Haybourne soils on inset alluvial fans, and Indian Creek soils on higher terrace remnants. The unit is about 5 percent Jowec Variant soils, 5 percent Haybourne soils, and 5 percent Indian Creek soils.

Permeability of this Spasprey soil is moderately slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for urban development and as rangeland.

This soil is well suited to use as sites for dwellings. The main limitation to use of this unit as septic tank absorption fields is the hardpan. The suitability of the soil for septic tank absorption fields can be improved by ripping the hardpan.

The susceptibility of this soil to frost heaving is a moderate limitation to use of this unit as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush and spiny hopsage. The production of forage is limited by the low precipitation, very low available water capacity, and the restricted depth of the root zone over the hardpan. The suitability of this soil for rangeland seeding is poor because of the low precipitation, the very low available water capacity, and the restricted depth of the root zone over the hardpan. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclass VIs, nonirrigated.

1194—Spasprey stony sandy loam, 4 to 8 percent slopes. This moderately deep, well drained soil is on lake terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,500 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown stony sandy loam about 3 inches thick. The subsoil is brown clay loam about 11 inches thick. The upper 9 inches of the substratum is light brownish gray sandy loam, the next 17 inches is a pale brown strongly cemented hardpan, and the lower part to a depth of 60 inches is pale brown sandy loam with varying degrees of cementation. Depth to the hardpan ranges from 20 to 30 inches.

Included in this unit are Incy soils on small sand dunes, Haybourne soils on inset alluvial fans, Indian Creek soils on higher terrace remnants, and Jowec Variant soils in shallow depressions. The unit is about 5 percent Incy soils, 3 percent Haybourne soils, 5 percent Indian Creek soils, and 2 percent Jowec Variant soils.

Permeability of this Spasprey soil is moderately slow. Available water capacity is very low. Effective rooting depth is 20 to 30 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used for urban development and as rangeland.

This soil is well suited to use as sites for the construction of dwellings. The main limitation to use of this unit as septic tank absorption fields is the hardpan. The suitability of the soil for septic tank absorption fields can be improved by ripping the hardpan.

The susceptibility of this soil to frost heaving is a moderate limitation to use of this soil as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, spiny hopsage, and Douglas rabbitbrush. A small amount of juniper is dispersed throughout. The production of forage is limited by the low precipitation, very low available water capacity, and the restricted depth of the root zone over the hardpan. The suitability of this soil for rangeland seeding is poor, mainly because of the low precipitation, the very low available water capacity, and the restricted depth of the root zone over the hardpan. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIs, nonirrigated.

1200—Mellor silt loam. This very deep, moderately well drained soil is on lake terraces and alluvial fans. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,200 to 5,200 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is about 115 days.

Typically, the surface layer is pale brown silt loam about 11 inches thick. The subsoil is pale brown silty clay loam about 15 inches thick. The substratum to a depth of 60 inches is silty clay loam.

Included in this unit are Doten soils on lower terraces or in draws; Turria soils, which occur on alluvial fans and are subject to frequent flooding; Incy soils on small sand dunes; and Rednik soils on higher elevations near drainageways. The unit is about 5 percent Doten soils, 5 percent Turria soils, 3 percent Incy soils, and 2 percent Rednik soils.

Permeability of this Mellor 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 slight. The surface layer is moderately affected by salt and alkali, and the subsoil and substratum are strongly affected by salt and alkali.

This unit is used for urban development and as rangeland.

If this unit is used for urban development, the high clay content is a moderate limitation to construction of dwellings. The high clay content results in moderately high shrink-swell potential, which can cause structural damage to buildings. Damage can be prevented by properly designing foundations and footings and by diverting water away from the soil near buildings. The main limitation to use of this soil as septic tank absorption fields is the slowly permeable subsoil. This

limitation can be overcome by increasing the size of the absorption field.

The main limitation to use of this soil as sites for roads is the low load-bearing strength. Suitable material should be added to provide a stable base.

The present vegetation in most areas is mainly black greasewood and Douglas rabbitbrush. The production of forage is limited by salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of salinity and alkalinity. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

This soil is in capability subclass VIIs, nonirrigated.

1210—Linhart stony coarse sand, 4 to 8 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 6,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 120 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is dark grayish brown stony coarse sand about 14 inches thick. The underlying material to a depth of 60 inches is grayish brown to light brownish gray stratified very gravelly coarse sand to very gravelly loamy coarse sand.

Included in this unit are Bedell soils on higher alluvial fans and Holbrook soils, which occur at lower elevations along drainageways and are subject to flooding for short periods in most years. The unit is about 8 percent Bedell soils and 7 percent Holbrook soils.

Permeability of this Linhart soil is 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 slight. This soil is subject to occasional flash flooding during storms of high intensity, usually during summer.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings and as septic tank absorption fields. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. Rapid permeability is also a limitation to use of this soil as septic tank absorption fields. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

Flooding is a limitation to use of this soil as sites for roads. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because the available water capacity is very low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IVs, irrigated, and VIIs, nonirrigated.

1211—Linhart stony coarse sand, 15 to 30 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,800 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 46 to 49 degrees F, and the average frost-free period is 90 to 120 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is dark grayish brown stony coarse sand about 14 inches thick. The underlying material to a depth of 60 inches is grayish brown to light brownish gray, stratified very gravelly coarse sand and very gravelly loamy coarse sand.

Included in this unit are Bedell soils on higher alluvial fans and Holbrook soils, which occur at lower elevations along drainageways and are subject to flooding for brief periods in most years. The unit is about 8 percent Bedell soils and 7 percent Holbrook soils.

Permeability of this Linhart soil is 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 slight. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland.

Flooding and steepness of slope are limitations to use of this unit as sites for construction of dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain.

The main limitations to use of this soil as septic tank absorption fields are rapid permeability and steepness of slope. Because the underlying material is rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of

seepage. Care should be taken to prevent surfacing of the leachate downslope.

The main limitation to use of this soil as sites for roads is the steepness of slope. Roads should be provided with drainage. They should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly big sagebrush, Anderson peachbrush, and antelope bitterbrush. The production of forage is limited by moderately low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because the available water capacity is very low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclass VIIs, nonirrigated.

1220—Calpine coarse sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from granitic rocks. Elevation is 4,800 to 5,500 feet. The average annual precipitation is about 10 to 12 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 80 to 100 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 19 inches thick. The upper 26 inches of the underlying material is brown sandy loam. The lower part to a depth of 60 inches is light yellowish brown loamy fine sand.

Included in this unit are Mottsville soils on higher alluvial fans, Linhart soils along drainageways, and Oest soils on higher terrace remnants. The unit is about 5 percent Mottsville soils, 6 percent Linhart soils, and 4 percent Oest soils.

Permeability of this Calpine 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 slight.

This unit is used as rangeland. It can be used for irrigated crops if water is available.

The present vegetation in most areas is mainly big sagebrush, antelope bitterbrush, and Indian ricegrass. The production of forage is limited by moderately low precipitation. The suitability of this soil for rangeland seeding is poor, mainly because the available water capacity is very low.

Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion. Clearing of brush would encourage the growth of desirable forage grasses.

Susceptibility of the soil to frost heaving is a moderate limitation to use of this soil as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

This soil is in capability subclasses IIIe, irrigated, and VIc, nonirrigated.

1240—Pizene sandy loam, 0 to 4 percent slopes. This very deep, well drained soil is on alluvial fans and outwash plains. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 49 to 51 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is pale brown sandy loam about 6 inches thick. The subsoil is brown sandy clay loam about 15 inches thick. The substratum to a depth of 60 inches is sandy loam.

Included in this unit are Rednik soils on the upper parts of alluvial fans, Doten soils on lower flood plains, and Aladshi soils on slightly higher terrace remnants. The unit is about 5 percent Rednik soils, about 5 percent Doten soils, and 5 percent Aladshi soils.

Permeability of this Pizene 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 slight. This soil is slightly affected by salt and alkali in the subsoil.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

This soil is well suited to use as sites for dwellings. This soil is well suited to use as septic tank absorption fields.

Roads can easily be constructed and maintained on this unit.

The present vegetation in most areas is mainly bud sagebrush and Douglas rabbitbrush. The production of forage is limited by low precipitation and salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of salinity and alkalinity and very low precipitation. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

This soil is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated.

1250—Rednik very gravelly sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,250 to 5,400 feet. The average annual precipitation is about 5 to 7 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 15 to 35 percent of the surface is covered with gravel. The surface layer is light brownish gray very gravelly sandy loam about 6 inches thick. The subsoil is brown very gravelly sandy clay loam about 14 inches thick. The substratum to a depth of 65 inches is very gravelly sandy loam and extremely gravelly loamy sand.

Included in this unit are Pizene soils on lower parts of alluvial fans, Bluewing soils along the higher parts of drainageways, and Aladshi soils on higher lying alluvial fans. The unit is about 5 percent Pizene soils, 5 percent Bluewing soils, and 5 percent Aladshi soils.

Permeability of this Rednik soil is moderately slow in the subsoil and very rapid in the substratum. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this soil as septic tank absorption fields is the very rapidly permeable substratum. Because the substratum is very rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies.

Flooding and stones are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface.

The present vegetation in most areas is mainly Indian ricegrass, bud sagebrush, and shadscale. The production of forage is limited by very low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and the very low precipitation. The duration and intensity of grazing should be adjusted to season of growth and precipitation.

This soil is in capability subclass VIIs, nonirrigated.

1251—Rednik very stony sandy loam, 8 to 15 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,250 to 5,400 feet. The average annual precipitation is about 5 to 7 inches, the average annual air temperature is 47 to 51 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is light brownish gray very stony sandy loam about 6 inches thick. The subsoil is brown very gravelly sandy clay loam about 14 inches thick. The substratum to a depth of 65 inches is very gravelly sandy loam and extremely gravelly loamy sand.

Included in this unit are Pizene soils on lower parts of alluvial fans, Bluewing soils along the higher parts of drainageways, and Kayo soils on higher-lying alluvial fans. The unit is about 5 percent Pizene soils, 5 percent Bluewing soils, and 5 percent Kayo soils.

Permeability of this Rednik soil is moderately slow in the subsoil and very rapid in the substratum. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitations to use of this unit as septic tank absorption fields are the very rapidly permeable substratum and steepness of slope. Because the substratum is very rapidly permeable, the leachate can run into the ground water or into nearby surface water before it is sufficiently purified. Absorption fields should be designed to avoid pollution of water supplies. Care should be taken to prevent surfacing of the leachate downslope.

Flooding, stones, and steepness of slope are moderate limitations to use of this unit as sites for roads. Roads should be provided with drainage and an adequate wearing surface. They should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The present vegetation in most areas is mainly Indian ricegrass, bud sagebrush, and shadscale. The production of forage is limited by very low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and the very low precipitation. The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

This soil is in capability subclass VIIs, nonirrigated.

1260—Thulepah-Mosquet association. This map unit is on uplands. Elevation is 7,000 to 8,300 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 41 to 44 degrees F, and the average frost-free period is less than 70 days.

This unit is 45 percent Thulepah very stony loam, 8 to 30 percent slopes, and 40 percent Mosquet very cobbly fine sandy loam, 4 to 30 percent slopes. The Thulepah soil is on rounded hilltops and plateaus, and the Mosquet soil is on mountain ridges.

Included in this unit are Softscrabble soils, which occur on lower concave side slopes; Rock outcrop, which

occurs as peaks and rims; and Ticino soils, which occur in snow pockets and support mountainmahogany. Also included are small areas of Gabica soils on south-facing ridges and wet areas that occur as seeps. The unit is about 4 percent Softscrabble soils, 3 percent Rock outcrop, 3 percent Ticino soils, 3 percent Gabica soils, and 2 percent wet areas.

The Thulepah soil is very deep and well drained. It formed in residuum and colluvium derived from basalt. Typically, 5 to 15 percent of the surface is covered with stones. The surface layer is dark brown very stony loam about 6 inches thick. The upper part of the subsoil, about 31 inches thick, is mainly dark brown and yellowish brown gravelly loam and gravelly clay loam that averages gravelly clay loam. The lower part to a depth of 60 inches or more is yellowish brown clay loam and silty clay loam.

Permeability of the Thulepah 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 slight.

The Mosquet soil is shallow and well drained. It formed in residuum derived dominantly from basalt. Typically, 35 to 60 percent of the surface is covered by rock fragments, mostly cobbles. The surface layer is grayish brown very cobbly fine sandy loam about 5 inches thick. The subsoil is dark brown gravelly clay and dark yellowish brown gravelly clay. Hard bedrock is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Mosquet 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 slight to moderate. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Thulepah soil is mainly big sagebrush, bluebunch wheatgrass, and Idaho fescue. The production of forage is limited by the short growing season and the cold temperature in spring. The suitability of this soil for rangeland seeding is poor, mainly because of the large stones on the surface.

The present vegetation in most areas of the Mosquet soil is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the short growing season and the cold temperature in spring, the very low available water capacity, the high clay content, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity and the restricted depth of the root zone over bedrock. Cold soil temperatures delay plant growth and readiness for grazing. Grazing should be delayed until the soils are warm and the plants have achieved sufficient growth. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

The main limitations to use of the unit as sites for roads are steepness of slope of both soils and the high clay content and shallowness over bedrock of the Mosquet soil. Deep cuts should be avoided because of the shallowness of the Mosquet soil over bedrock. Roads should be provided with an adequate wearing surface and should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1270—Tristan-Indiano-Lemm association. This map unit is on uplands. Elevation is 5,200 to 7,200 feet. The average annual precipitation is 10 to 12 inches, the average annual air temperature is 44 to 51 degrees F, and the average frost-free period is 80 to 110 days.

This unit is 30 percent Tristan very stony loam, 15 to 50 percent slopes; 30 percent Indiano gravelly loam, 30 to 50 percent slopes; and 25 percent Lemm very stony sandy loam, 15 to 30 percent slopes. The Tristan soil is on concave east- and north-facing slopes, the Indiano soil is on smooth side slopes, and the Lemm soil is on colluvial slopes and short alluvial fans.

Included in this unit are Old Camp soils on south-facing ridges, Duco soils near peaks and ridges at higher elevations, Frodo soils on small plateau remnants, and Rock outcrop on rims and peaks. The unit is about 5 percent Old Camp soils, 5 percent Duco soils, 3 percent Frodo soils, and 2 percent Rock outcrop.

The Tristan soil is deep and well drained. It formed in residuum and colluvium mainly from basalt. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is brown very stony loam about 7 inches thick. The upper part of the subsoil is brown very gravelly clay loam about 21 inches thick. The lower part of the subsoil is brown extremely cobbly loam about 21 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Tristan soil is moderately slow. Available water capacity of the soil is low. Effective rooting depth is 40 to 60 inches. Runoff is medium to high, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

The Indiano soil is moderately deep and well drained. It formed in residuum derived dominantly from metavolcanic rocks. Typically, 15 to 30 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly loam about 13 inches thick. The subsoil is yellowish brown clay loam about 20 inches thick. Unweathered bedrock is at a depth of 33 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Indiano soil is moderately slow. Available water capacity of the soil is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the

hazard of water erosion is high. The hazard of soil blowing is slight.

The Lemm soil is very deep and well drained. It formed in alluvium mainly from granitic rocks. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony sandy loam about 19 inches thick. The subsoil is pale brown very gravelly coarse sandy loam about 21 inches thick. The substratum is very pale brown very gravelly loamy coarse sand to a depth of 60 inches.

Permeability of the Lemm soil is moderately rapid. Available water capacity of the soil 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 as rangeland.

The present vegetation in most areas of the Tristan soil is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope, the large stones on the surface, and the very low available water capacity of the surface layer.

The present vegetation in most areas of the Indiano soil is mainly big sagebrush, antelope bitterbrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation, moderate available water capacity of the soil, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope.

The present vegetation in most areas of the Lemm soil is mainly big sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

The main limitations to use of this unit as sites for roads are the steepness of slope and the stones of the Tristan soil. Roads should be provided with an adequate wearing surface and located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Indiano soil is in capability subclass VIIe, nonirrigated. The Tristan and Lemm soils are in capability subclass VIIs, nonirrigated.

1271—Tristan-Barshaad-Arzo association. This map unit is on uplands. Elevation is 5,200 to 7,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 44 to 51 degrees F, and the average frost-free period is 80 to 100 days.

This unit is 30 percent Tristan very stony loam, 15 to 50 percent slopes; 30 percent Barshaad very stony loam, 2 to 15 percent slopes; and 25 percent Arzo very stony loam, 8 to 30 percent slopes. The Tristan soil is on concave east- and north-facing slopes, the Barshaad soil is on relatively flat slopes of plateaus and tops, and the Arzo soil is on lower foot slopes.

Included in this unit are Softscrabble soils on concave north-facing slopes at higher elevations in snowpockets, Reywat soils near ridges and peaks, Risley soils on south-facing slopes, and Duco soils on ridges at higher elevations. The unit is about 5 percent Softscrabble soils, 5 percent Reywat soils, 3 percent Risley soils, and 2 percent Duco soils.

The Tristan soil is deep and well drained. It formed in residuum and colluvium mainly from basalt. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is brown very stony loam about 7 inches thick. The upper part of the subsoil is brown very gravelly clay loam about 21 inches thick. The lower part of the subsoil is brown extremely cobbly loam about 21 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Tristan soil is moderately slow. Available water capacity of the soil is low. Effective rooting depth is 40 to 60 inches. Runoff is medium to high, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

The Barshaad soil is moderately deep and well drained. It formed in residuum derived dominantly from metavolcanic and metasedimentary rock. Typically, 3 to 15 percent of the surface is covered with stones and some cobbles. The surface layer is grayish brown very stony loam about 1 inch thick. The subsoil is brown gravelly clay about 23 inches thick. Weathered bedrock is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Barshaad soil is very slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Arzo soil is moderately deep and well drained. It formed in alluvium and colluvium mainly from basalt. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 2 inches thick. The subsoil is brown clay about 25 inches thick. The substratum is yellowish brown

gravelly loam about 8 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Arzo soil is slow. Available water capacity of the soil is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Tristan soil is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope, the large stones on the surface, and the very low available water capacity of the surface layer.

The present vegetation in most areas of the Barshaad soil is mainly low sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation, very low available water capacity, high clay content, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and the large stones on the surface.

The present vegetation in most areas of the Arzo soil is mainly big sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation, the low available water capacity of the soil, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is poor, mainly because of the large stones on the surface.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

The main limitations to use of this soil as sites for roads are the steepness of slope and stones of the Tristan soil; low load-bearing strength and high clay content of the Barshaad soil; and steepness of slope, low load-bearing strength, and high clay content of the Arzo soil. Suitable material should be added to provide a stable base and an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1272—Tristan-Arzo-Reywat association. This map unit is on uplands. Elevation is 5,200 to 7,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 45 to 50 degrees F, and the average frost-free period is 80 to 110 days.

This unit is 45 percent Tristan very stony loam, 15 to 50 percent slopes; 25 percent Arzo very stony loam, 8 to 30 percent slopes; and 15 percent Reywat extremely stony loam, 15 to 50 percent slopes. The Tristan soil is on east- and north-facing slopes. The Arzo soil is on lower foot slopes and rounded ridges. The Reywat soil is on ridges and crests.

Included in this unit are Duco soils on peaks at higher elevations, Frodo soils on plateau remnants, Nosrac soils on colluvial slopes near drainageways, Softscrabble soils on concave north-facing slopes in snowpockets, and Rubbleland on rock screes. The unit is about 3 percent Duco soils, 3 percent Frodo soils, 3 percent Nosrac soils, 3 percent Softscrabble soils, and 3 percent Rubbleland.

The Tristan soil is deep and well drained. It formed in residuum and colluvium mainly from basalt. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is brown very stony loam about 7 inches thick. The upper part of the subsoil is brown very gravelly clay loam about 21 inches thick. The lower part of the subsoil is brown extremely cobbly loam about 21 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Tristan soil is moderately slow. Available water capacity of the soil is low. Effective rooting depth is 40 to 60 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

The Arzo soil is moderately deep and well drained. It formed in alluvium and colluvium mainly from basalt. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 2 inches thick. The subsoil is brown clay about 25 inches thick. The substratum is yellowish brown gravelly loam about 8 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Arzo soil is slow. Available water capacity of the soil is slow. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Reywat soil is shallow and well drained. It formed in residuum from basic igneous rocks. Typically, 15 to 50 percent of the surface is covered with stones. The surface layer is grayish brown extremely stony loam about 6 inches thick. The subsoil is brown very gravelly clay loam about 12 inches thick. Bedrock is at a depth of 18 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Reywat soil is moderately slow. Available water capacity of the soil is very low. Effective

rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Tristan soil is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope, large stones on the surface, and the very low available water capacity of the surface layer.

The present vegetation in most areas of the Arzo soil is mainly big sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. A small amount of juniper is dispersed throughout. The production of forage is limited by moderately low precipitation, low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is poor, mainly because of the large stones on the surface.

The present vegetation in most areas of the Reywat soil is mainly big sagebrush, green ephedra, and cheatgrass. The production of forage is limited by the very low available water capacity and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, steepness of slope, large stones on the surface, and the restricted depth of the root zone.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

The main limitations to use of this soil as sites for roads are the steepness of slope and stones of the Tristan soil; low load-bearing strength, high clay content, and steepness of slope of the Arzo soil; and shallowness over bedrock and steepness of slope of the Reywat soil. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling, and to reduce erosion. Suitable material should be added to provide a stable base and an adequate wearing surface. Deep cuts in the Reywat soil should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1273—Tristan-Barshaad-Frodo association. This map unit is on uplands. Elevation is 5,200 to 7,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is 44 to 51 degrees F, and the average frost-free period is 80 to 110 days.

This unit is 30 percent Tristan very stony loam, 15 to 50 percent slopes; 30 percent Barshaad very stony sandy loam, 2 to 15 percent slopes; and 25 percent Frodo very stony loam, 8 to 30 percent slopes. The Tristan soil is on north- and east-facing slopes. The Barshaad soil is on plateaus. The Frodo soil is on pediments, rounded ridges, and tilted plateaus.

Included in this unit are Oppio soils on south- and west-facing slopes, Reywat soils near ridges and peaks, Nosrac soils on lower colluvial slopes near drainageways, and Rock outcrop as ridges and peaks. The unit is about 7 percent Oppio soils, 3 percent Reywat soils, about 3 percent Nosrac soils, and 2 percent Rock outcrop.

The Tristan soil is deep and well drained. It formed in residuum and colluvium mainly from basalt. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is brown very stony loam about 7 inches thick. The upper part of the subsoil is brown very gravelly clay loam about 21 inches thick. The lower part of the subsoil is brown extremely cobbly loam about 21 inches thick over weathered bedrock. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Tristan soil is moderately slow. Available water capacity of the soil is low. Effective rooting depth is 40 to 60 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is slight.

The Barshaad soil is moderately deep and well drained. It formed in residuum derived dominantly from metavolcanic and metasedimentary rock. Typically, 3 to 15 percent of the surface is covered with stones and some cobbles. The surface layer is grayish brown very stony loam about 1 inch thick. The subsoil is brown gravelly clay about 23 inches thick. Weathered bedrock is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Barshaad soil is very slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Frodo soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from basalt. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony loam about 6 inches thick. The subsoil is brown clay about 12 inches thick. A continuous strongly cemented hardpan is at a depth of 18 inches. Depth to the hardpan ranges from 14 to 20 inches. The pan is underlain by hard bedrock.

Permeability of the Frodo soil is slow. Available water capacity is very low. Effective rooting depth is 14 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 as rangeland.

The present vegetation in most areas of the Tristan soil is mainly big sagebrush, antelope bitterbrush, and Thurber needlegrass. A small amount of juniper is dispersed throughout. The production of forage is limited by the moderately low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope, the large stones on the surface, and the very low available water capacity of the surface layer.

The present vegetation in most areas of the Barshaad soil is mainly low sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by the moderately low precipitation, very low available water capacity, high clay content, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, the abrupt textural boundary, and large stones on the surface.

The present vegetation in most areas of the Frodo soil is mainly low sagebrush, Douglas rabbitbrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, the shallowness of the root zone over the hardpan, and the large stones on the surface.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The main limitations to use of this soil as sites for roads are the steepness of slope and stones of the Tristan soil; low load-bearing strength and high shrink-swell potential of the Barshaad soil; and depth to bedrock, low load-bearing strength, and steepness of slope of the Frodo soil. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Suitable material should be added to provide a stable base and an adequate wearing surface. Deep cuts should be avoided in the Frodo soil because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1290—Parran silty clay loam, rarely flooded. This very deep, poorly drained soil is in basins and on low lake terraces. It formed in alluvium and lacustrine deposits derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,000 to 4,200 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is light brownish gray silty clay loam about 5 inches thick. The underlying material to a depth of 60 inches is light brownish gray and light olive gray silty clay.

Included in this unit are Doten soils on higher parts of flood plains, Dalzell soils on higher terrace remnants, Pizene soils on higher alluvial fans, and wet areas that occur as seeps. The unit is about 5 percent Doten soils, 5 percent Dalzell soils, 3 percent Pizene soils, and 2 percent wet areas.

Permeability of this Parran soil is very slow. The available water capacity is high if the salt is removed. Effective rooting depth is more than 60 inches if the content and water table are lowered. Runoff is ponded, and the hazard of water erosion is slight. The hazard of soil blowing is slight. This soil is very strongly salt- and alkali-affected. It has a water table at a depth of 24 to 36 during winter and spring. It is subject to shallow flooding during storms of prolonged high intensity.

This unit is used as rangeland.

The present vegetation in most areas is mainly saltgrass and black greasewood. The production of forage is limited by very low precipitation and salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of the salinity and alkalinity and very low precipitation. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

The main limitations to use of this soil as sites for roads are the susceptibility of the soil to frost heaving, the low load-bearing strength, and the high clay content. Roads should be provided with drainage. Suitable material should be added to provide a stable base and an adequate wearing surface.

This soil is in capability subclass VIIw, nonirrigated.

1300—Rose Creek Variant sandy loam. This very deep, moderately well drained soil is on lake terraces and flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,000 to 4,400 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is about 100 days.

Typically, the surface layer is light brownish gray sandy loam about 5 inches thick. The subsoil is light brownish gray very fine sandy loam about 7 inches thick. The substratum to a depth of 60 inches is stratified gravelly loamy sand to loam.

Included in this unit are Pizene soils on higher terrace remnants, Mottsville soils on higher alluvial fans, and Doten soils in shallow depressions. The unit is about 5

percent Pizene soils, 5 percent Mottsville soils, and 5 percent Doten soils.

Permeability of this Rose Creek Variant soil 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 slight. The hazard of soil blowing is slight. The seasonal high water table is at a depth of 60 to 72 inches in spring. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this soil as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this soil as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

The use of this soil as sites for roads is moderately limited by flooding and the susceptibility of the soil to frost heaving. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, big saltbush, and basin wildrye. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIc, irrigated, and VIc, nonirrigated.

1301—Rose Creek Variant loamy fine sand. This very deep, moderately well drained soil is on lake terraces and flood plains. It formed in alluvium derived from mixed rock sources. Slopes are 0 to 2 percent. Elevation is 4,000 to 4,400 feet. The average annual precipitation is about 8 to 10 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is about 100 days.

Typically, the surface layer is light brownish gray loamy fine sand about 5 inches thick. The subsoil is light brownish gray very fine sandy loam about 7 inches thick. The substratum to a depth of 60 inches is stratified gravelly loamy sand to loam.

Included in this unit are Pizene soils on higher terrace remnants, Mottsville soils on higher alluvial fans, and Doten soils in shallow depressions. The unit is about 5 percent Pizene soils, 5 percent Mottsville soils, and 5 percent Doten soils.

Permeability of this Rose Creek Variant soil 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 slight. The hazard of soil blowing is moderate. The seasonal high water table is at a depth of 60 to 72 inches in spring. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used for urban development and as rangeland. It can be used for irrigated crops if water is available.

Flooding is a limitation to use of this unit as sites for dwellings. Flash floods can occur on this soil during storms of unusually high intensity. Structures for protection from such floods are difficult to establish and maintain. The main limitation to use of this unit as septic tank absorption fields is the moderately slowly permeable subsoil. This limitation can be overcome by increasing the size of the absorption field.

The main limitations to use of this unit as sites for roads are flooding and the susceptibility of the soil to frost heaving. Roads should be provided with drainage.

The present vegetation in most areas is mainly big sagebrush, big saltbrush, and basin wildrye. The production of forage is limited by low precipitation. This soil is rated as poorly suited to rangeland seeding, mainly because precipitation is low. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. Clearing of brush would encourage the growth of desirable forage grasses.

This soil is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated.

1310—Bango gravelly sandy loam, 0 to 8 percent slopes. This very deep, well drained soil is on lake terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,000 to 4,200 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 51 to 53 degrees F, and the average frost-free period is about 130 days.

Typically, 15 to 35 percent of the surface is covered with gravel. The surface layer is light brownish gray gravelly sandy loam about 2 inches thick. The subsoil is pale brown loam about 8 inches thick. The substratum to a depth of 60 inches is stratified gravelly fine sandy loam to silt loam.

Included in this unit are Stumble soils on higher alluvial fans, Isolde soils on sand dunes, Bundorf soils on higher terrace remnants, and Ruhe soils on lower terraces near tufa outcrops. This unit is about 5 percent Stumble soils, 5 percent Isolde soils, 3 percent Bundorf soils, and 2 percent Ruhe soils.

Permeability of this Bango 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 slight. This soil is slightly salt- and alkali-affected.

This unit is used as rangeland.

The present vegetation in most areas is mainly Bailey greasewood, shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by very low precipitation and salinity and alkalinity. The suitability of this soil for rangeland seeding is very poor, mainly because of very low precipitation and salinity and alkalinity. Grazing should be adjusted to season of growth and precipitation.

The high clay content of this soil is a moderate limitation to use of the unit as sites for roads. Roads should be provided with an adequate wearing surface.

This soil is in capability subclass VIIs, nonirrigated.

1320—Osobb-Rezave-Fireball association. This map unit is on uplands. Elevation is 4,400 to 7,000 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 50 degrees F., and the average frost-free period is 90 to 100 days.

This unit is 35 percent Osobb extremely stony fine sandy loam, 30 to 50 percent slopes; 25 percent Rezave extremely stony very fine sandy loam, 0 to 15 percent slopes; and 25 percent Fireball extremely stony fine sandy loam, 30 to 50 percent slopes. The Osobb soil occurs on smooth and slightly convex side slopes. The Rezave soil occurs on plateau tops. The Fireball soil occurs on colluvial, slightly concave side slopes.

Included in this unit are Pirouette soils on smooth slopes and plateaus near Rock outcrop, Flex soils at higher elevations on east- and north-facing slopes, and Rock outcrop as small peaks and rims. The unit is about 5 percent Pirouette soils, 5 percent Flex soils, and 5 percent Rock outcrop.

The Osobb soil is shallow and well drained. It formed in residuum of volcanic rocks. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is light brownish gray extremely stony fine sandy loam about 2 inches thick. The subsoil is pale brown very gravelly loam about 9 inches thick. The substratum is a very pale brown indurated hardpan about 2 inches thick over fractured bedrock. Depth to the hardpan ranges from 8 to 20 inches.

Permeability of the Osobb soil is moderately rapid. 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 slight.

The Rezave soil is shallow and well drained. It formed in residuum derived dominantly from basalt. Typically, 15 to 50 percent of the surface is covered with stones. The surface layer is light brownish gray extremely stony very fine sandy loam about 4 inches thick. The subsoil is light yellowish brown stony clay about 9 inches thick. The substratum to a depth of 19 inches or more is yellow, weakly silica-cemented gravelly clay loam. Hard basalt bedrock is at a depth of 19 inches. Depth to bedrock ranges from 14 to 20 inches.

Permeability of the Rezave soil is slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Fireball soil is deep and well drained. It formed in residuum derived dominantly from basalt. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is light brownish gray extremely stony fine sandy loam about 3 inches thick. The subsoil is light yellowish brown very cobbly loam about 21 inches thick. The substratum to a depth of 47 inches or more is white extremely cobbly loam. Hard basalt bedrock is at a depth of 47 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Fireball soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Osobb soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation, the very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, the very low available water capacity of the surface layer, the large stones on the surface, the steepness of slope, and the shallow root zone.

The present vegetation in most areas of the Rezave soil is mainly Bailey greasewood, spiny hopsage, and Indian ricegrass. The production of forage is limited by the very low precipitation, the shallowness of the root zone over bedrock, and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, the shallowness of the root zone, and the very low available water capacity of the surface layer.

The present vegetation in most areas of the Fireball soil is mainly Bailey greasewood, shadscale, and bud sagebrush. The production of forage is limited by the very low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, the steepness of slope, and the large stones on the surface.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of this soil as sites for roads are the shallowness over bedrock, steepness of slope, and stones of the Osobb soil, shallowness of the Rezave soil, and steepness of slope of the Fireball soil. Deep cuts should be avoided because of the underlying bedrock. Roads should be provided with an adequate wearing surface and located in less sloping areas, if

feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1330—Sutcliff-Kleinbush-Washoe association. This map unit is on dissected alluvial fans. Elevation is 4,400 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 45 percent Sutcliff very stony loam, 4 to 15 percent slopes; 20 percent Kleinbush very cobbly loamy sand, 0 to 8 percent slopes; and 20 percent Washoe extremely stony fine sandy loam, 4 to 15 percent slopes. The Sutcliff soil is on the lower alluvial fan remnants and the side slopes of the dissection. The Kleinbush soil is on the higher alluvial fan remnants. The Washoe soil is along the drainageways.

Included in this unit are Rezave soils on upland hill remnants, Bundorf soils on slightly concave areas on the higher lying alluvial fan remnants, and Reno soils on north- and east-facing slopes at higher elevations. The unit is about 5 percent Rezave soils, 5 percent Bundorf soils, and 5 percent Reno soils.

The Sutcliff soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is pale brown very stony loam about 5 inches thick. The subsoil is light yellowish brown very stony clay loam about 20 inches thick. The substratum is pinkish gray very cobbly loam about 17 inches thick over a strongly silica-cemented hardpan. Depth to the hardpan ranges from 40 to 60 inches.

Permeability of the Sutcliff soil is moderately slow. Available water capacity is low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Kleinbush soil is very deep and well drained. It formed in alluvium derived dominantly from basalt. Typically, 5 to 15 percent of the surface is covered with cobbles. The surface layer is light gray very cobbly loamy sand about 4 inches thick. The subsurface layer is light gray very fine sandy loam about 1 inch thick. The subsoil is light brown clay about 33 inches thick. The substratum to a depth of 60 inches or more is light gray cobbly sandy clay loam.

Permeability of the Kleinbush 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 slight.

The Washoe soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, 15 to 50 percent of the surface is covered with stones. The surface layer is brown extremely stony fine sandy loam about 11 inches thick. The subsoil is brown very gravelly sandy clay loam about 31 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown, stratified gravelly loamy coarse sand and very cobbly loamy coarse sand.

Permeability of the Washoe 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 slight. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Sutcliff soil is mainly Bailey greasewood, bud sagebrush, and Indian ricegrass. The production of forage is limited by very low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation and the large stones on the surface.

The present vegetation in most areas of the Kleinbush soil is mainly shadscale, bud sagebrush, and Indian ricegrass. The production of forage is limited by the very low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation and the large stones on the surface.

The present vegetation in most areas of the Washoe soil is mainly big sagebrush. The production of forage is limited by low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the large stones on the surface and the very low available water capacity of the surface layer.

Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure. The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of this unit as sites for roads are the low load-bearing strength of the Sutcliff soil and Kleinbush soil and steepness of slope, susceptibility to frost heaving, and high clay content of the Washoe soil. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface and a stable base.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1331—Sutcliff-Bundorf-Kleinbush association. This map unit is on dissected alluvial fans. Elevation is 4,400 to 7,400 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 35 percent Sutcliff very stony loam, 4 to 15 percent slopes; 35 percent Bundorf very stony loam, 4 to 15 percent slopes; and 15 percent Kleinbush very cobbly loamy sand, 0 to 8 percent slopes. The Sutcliff soil is on lower lying alluvial fans. The Bundorf soil is on higher lying alluvial fan remnants. The Kleinbush soil is on the toe slopes of the higher lying alluvial fans.

Included in this unit are Washoe soils along drainageways, Bluewing soils near mouths of canyons and in drainageways, and Stumble soils on alluvial fan skirts. The unit is about 5 percent Washoe soils, 5 percent Bluewing soils, and 5 percent Stumble soils.

The Sutcliff soil is deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is pale brown very stony loam about 5 inches thick. The subsoil is light yellowish brown very stony clay loam about 20 inches thick. The substratum is pinkish gray very cobbly loam about 17 inches thick over a strongly silica-cemented hardpan. Depth to the hardpan ranges from 40 to 60 inches.

Permeability of the Sutcliff soil is moderately slow. Available water capacity is low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Bundorf soil is shallow and well drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is light gray very stony loam about 2 inches thick. The upper part of the subsoil is pale brown clay about 8 inches thick. The lower part of the subsoil is light brown very cobbly clay loam about 4 inches thick. The substratum is light yellowish brown, very cobbly loam about 5 inches thick over an indurated hardpan. Depth to the hardpan ranges from 14 to 20 inches.

Permeability of the Bundorf soil is slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Kleinbush soil is very deep and well drained. It formed in alluvium derived dominantly from basalt. Typically, 5 to 15 percent of the surface is covered with cobbles. The surface layer is light gray very cobbly loamy sand about 4 inches thick. The subsurface layer is light gray very fine sandy loam about 1 inch thick. The subsoil is light brown clay about 33 inches thick. The substratum to a depth of 60 inches or more is light gray cobbly sandy clay loam.

Permeability of the Kleinbush 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 slight.

This unit is used as rangeland.

The present vegetation in most areas of the Sutcliff soil is mainly Bailey greasewood, bud sagebrush, and Indian ricegrass. The production of forage is limited by the very low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation and the large stones on the surface.

The present vegetation in most areas of the Bundorf soil is mainly shadscale, bud sagebrush, and Indian ricegrass. The production of forage is limited by the very low precipitation, very low available water capacity, and the shallowness of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation and the shallowness of the root zone.

The present vegetation in most areas of the Kleinbush soil is mainly shadscale, bud sagebrush, and Indian ricegrass. The production of forage is limited by very low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, and the large stones on the surface.

The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of this unit as sites for roads are the low load-bearing strength of the Sutcliff soil, the hardpan and high clay content of the Bundorf soil, and the low load-bearing strength of the Kleinbush soil. Suitable material should be added to provide a stable base and an adequate wearing surface. Deep cuts should be avoided because of the underlying hardpan of the Bundorf soil.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1340—Hawsley-Ruhe-Bluewing association. This map unit is on alluvial fans, terraces, and flood plains. Elevation is 4,000 to 4,400 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 110 to 130 days.

This unit is 50 percent Hawsley sand, 2 to 8 percent slopes; 20 percent Ruhe gravelly loamy sand, 0 to 8 percent slopes; and 15 percent Bluewing very stony loamy sand, 4 to 15 percent slopes. The Hawsley soil is on alluvial fans. The Ruhe soil is on tufa-controlled terraces. The Bluewing soil is on flood plains and in drainageways.

Included in this unit are Toulon soils on shoreline terraces, Trocken soils on lower alluvial fans, and tufa Rock outcrop as peaks. The unit is about 6 percent Toulon soils, 5 percent Trocken soils, and 4 percent Rock outcrop.

The Hawsley soil is very deep and somewhat excessively drained. It formed in water-reworked eolian sands derived from mixed rock sources. Slope is 2 to 8 percent. Typically, the surface layer is pale brown sand about 8 inches thick. The underlying material to a depth of 60 inches or more is pale brown, stratified fine sand to coarse sand.

Permeability of the Hawsley soil is very rapid. Available water capacity of the soil 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 moderate.

The Ruhe soil is shallow and well drained. It formed in sandy alluvium derived from mixed rock sources. Typically, 15 to 35 percent of the surface is covered with

gravel. The surface layer is pale brown gravelly loamy sand about 14 inches thick. Lithoid tufa is at a depth of 14 inches and is about 21 inches thick. The underlying material to a depth of 60 inches is light brownish gray very cobbly coarse sand. Depth to lithoid tufa ranges from 14 to 20 inches.

Permeability of the Ruhe soil is rapid. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Bluewing soil is very deep and excessively drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is light brownish gray very stony loamy sand about 9 inches thick. The underlying material to a depth of 60 inches or more is pale brown stratified very gravelly loamy coarse sand and very gravelly sand.

Permeability of the Bluewing 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 slight. This soil is subject to occasional flash flooding during storms of high-intensity, which usually occur in summer. Channeling and deposition are common along streambanks.

This unit is used as rangeland.

The present vegetation in most areas of the Hawsley soil is mainly Bailey greasewood, spiny hopsage, and Indian ricegrass. The production of forage is limited by the very low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation and the very low available water capacity.

The present vegetation in most areas of the Ruhe soil is mainly winterfat, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation, the shallowness of the root zone over bedrock, and the very low available water capacity. The suitability of this soil for rangeland seeding is very poor. The main limitations for seeding are the very low precipitation, the very low available water capacity of the surface layer, and the shallowness of the root zone.

The present vegetation in most areas of the Bluewing soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor because of the very low precipitation and the very low available water capacity of the surface layer.

The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of these soils as sites for roads are the shallowness over rock of the Ruhe soil and flooding on the Bluewing soil. Roads should be located in areas of the Hawsley soil if feasible.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1341—Isolde-Dune land complex, hilly. This map unit is on sand dunes superimposed over terraces and alluvial fans. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 4 to 6 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 110 to 130 days.

This unit is 45 percent Isolde fine sand, 0 to 15 percent slopes, and 40 percent Dune land, 4 to 30 percent slopes. The Isolde soil is on stabilized sand dunes. The Dune land is on unstabilized, drifting sand dunes. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Bluewing soils in drainageways, Ruhe soils near outcrops of tufa, tufa Rock outcrop, and Playas on the bottom of windswept troughs. The unit is about 4 percent Bluewing soils, 4 percent Ruhe soils, 4 percent Rock outcrop, and 3 percent Playas.

The Isolde soil is very deep and excessively drained. It formed in wind-deposited sands derived from mixed rock sources. Slopes are 0 to 15 percent. Typically, the surface layer is light brownish gray fine sand about 6 inches thick. The underlying material to a depth of 60 inches is light gray fine sand.

Permeability of the Isolde soil is very rapid. Available water capacity of the soil 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 moderate.

The Dune land is windblown sand deposited above the Isolde soil. It is susceptible to wind erosion.

This unit is used as rangeland.

The present vegetation in most areas of the Isolde soil is mainly spiny hopsage, hairy horsebrush, and Indian ricegrass. The production of forage is limited by very low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor because of the very low precipitation and the very low available water capacity of the surface layer.

The intensity and duration of grazing should be adjusted to season of growth and to precipitation. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

Roads can easily be constructed and maintained on this unit.

This soil is in capability subclass VIIs, nonirrigated.

1342—Isolde-Playas association. This map unit is on sand dunes over superimposed lake terraces and basins. Elevation is 3,900 to 5,000 feet. The average annual precipitation is 4 to 6 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 110 to 130 days.

This unit is 70 percent Isolde fine sand, 0 to 15 percent slopes, and 15 percent Playas. The Isolde soil is on sand dunes, and Playas are in the basins.

Included in this unit are Toulon soils on higher shoreline terraces and Bluewing soils on alluvial fans. The unit is about 8 percent Toulon soils and 7 percent Bluewing soils.

The Isolde soil is very deep and excessively drained. It formed in wind-deposited sands derived from mixed rock sources. Slopes are 0 to 15 percent. Typically, the surface layer is light brownish gray fine sand about 6 inches thick. The underlying material to a depth of 60 inches is light gray fine sand.

Permeability of the Isolde soil is very rapid. Available water capacity of the soil 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 moderate.

This unit is used as rangeland.

The present vegetation in most areas of the Isolde soil is mainly spiny hopsage, hairy horsebrush, and Indian ricegrass. The production of forage is limited by very low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor because of the very low precipitation and the very low available water capacity of the surface layer.

The duration and intensity of grazing should be adjusted to season of growth and to precipitation. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

Roads should be located in areas of the Isolde soil, if feasible.

The Isolde soil is in capability subclass VIIs, nonirrigated.

1344—Isolde-Toulon complex, 0 to 15 percent slopes. This map unit is on lake terraces and on sand dunes over terraces. Elevation is 3,800 to 4,300 feet. The average annual precipitation is 4 to 6 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 110 to 130 days.

This unit is 55 percent Isolde fine sand, 0 to 15 percent slopes, and 30 percent Toulon very gravelly loam, 2 to 8 percent slopes. The Isolde soil is on sand dunes. The Toulon soil is on remnant lake bars and shoreline terraces. Areas of these soils are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Stumble soils on alluvial fans, Bluewing soils near drainageways and on upper parts of alluvial fans, and Playas in shallow windswept depressions. The unit is about 5 percent Stumble soils, 6 percent Bluewing soils, and 4 percent Playas.

The Isolde soil is very deep and excessively drained. It formed in wind-deposited sands derived from mixed rock sources. Slopes are 0 to 15 percent. Typically, the surface layer is light brownish gray fine sand about 6 inches thick. The underlying material to a depth of 60 inches is light gray fine sand.

Permeability of the Isolde soil is very rapid. Available water capacity of the soil 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.

The Toulon soil is very deep and excessively drained. It formed in alluvium derived from mixed rock sources. Typically, 45 to 60 percent of the surface is covered with gravel. The surface layer is pale brown very gravelly loam about 6 inches thick. The subsoil is very gravelly sandy loam about 7 inches thick. The substratum to a depth of 60 inches or more is stratified very gravelly coarse sand to very cobbly coarse sand.

Permeability of the Toulon soil is moderately rapid. Available water capacity of the soil 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 slight.

This unit is used as rangeland.

The present vegetation in most areas of the Isolde soil is mainly spiny hopsage, hairy horsebrush, and Indian ricegrass. The production of forage is limited by very low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation and the very low available water capacity of the surface layer.

The present vegetation in most areas of the Toulon soil is mainly Bailey greasewood, shadscale, and bud sagebrush. The production of forage is limited by the very low precipitation and low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because precipitation is very low.

The intensity and duration of grazing should be adjusted to season of growth and to precipitation. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

Stones are a limitation to use of the Toulon soil as sites for roads. Roads should be located in areas of the Isolde soil if feasible.

The soils in this unit are capability subclass VIIs, nonirrigated.

1345—Hawsley sand, 2 to 8 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans. It formed in water-reworked eolian deposits derived from mixed rock sources. Elevation is 3,900 to 4,400 feet. The average annual precipitation is about 4 to 7 inches, the average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is pale brown sand about 8 inches thick. The underlying material to a depth of 60 inches is pale brown, stratified fine sand through coarse sand.

Included in this unit are Bluewing soils near the mouths of canyons and along drainageways, Trocken soils on slightly higher alluvial fan remnants, and Ruhe soils on small remnants of tufa-controlled terraces. The unit is about 5 percent Bluewing soils, 5 percent Trocken soils, and 5 percent Ruhe soils.

Permeability of this Hawsley soil is very rapid. Available water capacity of the soil 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 unit is used as rangeland.

The present vegetation in most areas is mainly Bailey greasewood, spiny hopsage, and Indian ricegrass. The production of forage is limited by very low precipitation and the low available water capacity of the soil. The suitability of this soil for rangeland seeding is very poor, mainly because of very low precipitation and the very low available water capacity of the surface layer.

The duration and intensity of grazing should be adjusted to season of growth and to precipitation. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

Roads can easily be constructed and maintained on this unit.

This soil is in capability subclass VIIs, nonirrigated.

1350—Stumble-Ruhe-Bluewing association. This map unit is on alluvial fans and terraces. Elevation is 4,000 to 4,400 feet. The average annual precipitation is 4 to 6 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 110 to 130 days.

This unit is 40 percent Stumble loamy sand, 4 to 15 percent slopes; 30 percent Ruhe gravelly loamy sand, 2 to 8 percent slopes; and 15 percent Bluewing very stony loamy sand, 4 to 8 percent slopes. The Stumble soil is on alluvial fans. The Ruhe soil is on tufa-controlled terraces. The Bluewing soil is on upper parts of alluvial fans and on flood plains.

Included in this unit are Isolde soils on sand dunes and tufa Rock outcrop as peaks and rims. The unit is about 9 percent Isolde soils and 6 percent Rock outcrop.

The Stumble soil is very deep and somewhat excessively drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown loamy sand about 2 inches thick. The upper 22 inches of underlying material is pale brown loamy sand. The next part to a depth of 43 inches is light brownish gray gravelly loamy sand and loamy sand. Below this to a depth of 60 inches is stratified gravel and very gravelly sand.

Permeability of the Stumble soil is 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 moderate.

The Ruhe soil is shallow and well drained. It formed in alluvium derived from mixed rock sources. Typically, 15 to 35 percent of the surface is covered with gravel. The surface layer is pale brown gravelly loamy sand about 14 inches thick. Lithoid tufa is at a depth of 14 inches and is about 21 inches thick. The underlying material to a depth of 60 inches is light brownish gray very cobbly coarse sand. Depth to lithoid tufa ranges from 14 to 20 inches.

Permeability of the Ruhe soil is rapid. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Bluewing soil is very deep and excessively drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is light brownish gray very stony loamy sand about 9 inches thick. The underlying material to a depth of 60 inches or more is pale brown stratified very gravelly loamy coarse sand and very gravelly sand.

Permeability of the Bluewing 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 slight. This soil is subject to occasional flash flooding during storms of high intensity, which usually occur in summer. Channeling and deposition are common along streambanks.

This unit is used as rangeland.

The present vegetation in most areas of the Stumble soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and very low precipitation.

The present vegetation in most areas of the Ruhe soil is mainly winterfat, shadscale, and Indian ricegrass. The production of forage is limited by very low precipitation, the shallowness of the root zone over bedrock, and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, the very low available water capacity of the surface layer, and the shallowness of the root zone.

The present vegetation in most areas of the Bluewing soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation and the very low available water capacity of the surface layer.

The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

The main limitations to use of this soil as sites for roads are depth to rock of the Ruhe soil, flooding on the Bluewing soil, and steepness of slope of the Stumble soil. Roads should be provided with drainage and should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1351—Stumble loamy sand, 4 to 8 percent slopes. This very deep, somewhat excessively drained soil is on alluvial fans and terraces. It formed in alluvium derived from mixed rock sources. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is about 130 days.

Typically, the surface layer is dark brown loamy sand about 6 inches thick. The upper 23 inches of the underlying material is pale brown loamy sand. The lower part to a depth of 50 inches is light brownish gray gravelly loamy sand.

Included in this unit are Isolde soils on sand dunes, Ruhe soils on tufa-controlled terraces, Trocken soils near channels on alluvial fans, and Bluewing soils in drainageways. The unit is about 4 percent Isolde soils, 3 percent Ruhe soils, 4 percent Trocken soils, and 4 percent Bluewing soils.

Permeability of the Stumble soil is 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 moderate.

This unit is used as rangeland.

The present vegetation in most areas is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer and very low precipitation.

The duration and intensity of grazing should be adjusted to season of growth and to precipitation. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion.

Roads can be easily constructed and maintained on this unit.

This soil is in capability subclass VIIs, nonirrigated.

1360—Trocken-Stumble-Bluewing association. This map unit is on alluvial fans. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 130 days.

This unit is 45 percent Trocken very stony sandy loam, 4 to 15 percent slopes; 20 percent Stumble loamy sand, 4 to 15 percent slopes; and 20 percent Bluewing very stony loamy sand, 4 to 15 percent slopes. The Trocken soil is on alluvial fans. The Stumble soil is on alluvial fan skirts. The Bluewing soil is in drainageways of alluvial fans.

Included in this unit are Isolde soils on sand dunes and Ruhe soils on tufa-controlled terraces. The unit is about 9 percent Isolde soils and 6 percent Ruhe soils.

The Trocken soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is pale brown very stony sandy loam about 3 inches thick. The subsoil is brown gravelly sandy loam about 8 inches thick. The substratum to a depth of 60 inches or more is brown, stratified extremely gravelly loamy coarse sand to very cobbly loam.

Permeability of the Trocken soil is moderate. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

The Stumble soil is very deep and somewhat excessively drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is dark brown loamy sand about 2 inches thick. The upper 22 inches of the underlying material is pale brown loamy sand. The lower part to a depth of 60 inches is light brownish gray gravelly loamy sand.

Permeability of the Stumble soil is 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 moderate.

The Bluewing soil is very deep and excessively drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is light brownish gray very stony loamy sand about 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, stratified very gravelly loamy coarse sand to extremely gravelly sand.

Permeability of the Bluewing 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 slight. This soil is subject to occasional flash flooding during storms of high intensity, usually in summer.

This unit is used as rangeland.

The present vegetation in most areas of the Trocken soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by very low precipitation and low available water capacity. This soil is rated as very poorly suited to rangeland seeding, mainly because precipitation is very low.

The present vegetation in most areas of the Stumble soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by very low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation.

The present vegetation in most areas of the Bluewing soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by very low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of very low precipitation and the very low available water capacity of the surface layer.

The duration and intensity of grazing should be adjusted to season of growth and precipitation. To insure unform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

The main limitations to use of this soil as sites for roads are flooding and steepness of slope of the Trocken soil, flooding on the Bluewing soil, and steepness of slope of the Stumble soil. Roads should be provided with drainage and should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1361—Trocken-Ruhe-Bluewing association. This map unit is on alluvial fans and terraces. Elevation is 4,000 to 4,400 feet. The average annual precipitation is 4 to 6 inches, the average annual air temperature is 48 to 50 degrees F, and the average annual frost-free period is 90 to 110 days.

This unit is 35 percent Trocken very stony sandy loam, 4 to 15 percent slopes; 35 percent Ruhe very stony loamy sand, 4 to 15 percent slopes; and 15 percent Bluewing very stony loamy sand, 4 to 15 percent slopes. The Trocken soil is on alluvial fans. The Ruhe soil is on tufa-controlled terraces. The Bluewing soil is on alluvial fans near the mouths of canyons and along drainageways.

Included in this unit are Isolde soils on sand dunes and Stumble soils on alluvial fan skirts. The unit is about 8 percent Isolde soils and 7 percent Stumble soils.

The Trocken soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is pale brown very stony sandy loam about 3 inches thick. The underlying material to a depth of 60 inches or more is brown, stratified extremely gravelly loamy coarse sand to very cobbly loam.

Permeability of the Trocken soil is moderate. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity.

The Ruhe soil is shallow and well drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is pale brown very stony loamy sand about 6 inches thick. The subsoil is light brownish gray gravelly loamy sand 8 inches thick. Below that is lithoid tufa about 14 inches thick. The underlying material to a depth of 60 inches is light brownish gray, stratified very cobbly coarse sand to sand. Depth to lithoid tufa ranges from 14 to 20 inches.

Permeability of the Ruhe soil is rapid. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Bluewing soil is very deep and excessively drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is light brownish gray very stony loamy sand about 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, stratified very gravelly loamy coarse sand to extremely gravelly sand.

Permeability of the Bluewing 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 slight. This soil is subject to occasional flash flooding during storms of high intensity.

This unit is used as rangeland.

The present vegetation in most areas of the Trocken soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by very low precipitation and low available water capacity. This soil is rated as very poorly suited to rangeland seeding, mainly because precipitation is very low.

The present vegetation in most areas of the Ruhe soil is mainly winterfat, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation, the shallowness of the root zone over bedrock, and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, the very low available water capacity of the surface layer, and the shallowness of the root zone.

The present vegetation in most areas of the Bluewing soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation and the very low available water capacity of the surface layer.

The duration and intensity of grazing should be adjusted to season of growth and to precipitation. To insure uniform grazing, salt blocks should be placed in

less accessible areas rather than near water or in easily accessible areas.

The main limitations to use of this soil as sites for roads are susceptibility to flooding of the Trocken and Bluewing soils, steepness of slope of the Trocken and Ruhe soils, and the shallowness over rock of the Ruhe soil. Roads should be provided with drainage and should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1362—Trocken-Badland complex, 4 to 15 percent slopes. This map unit is on alluvial fans and terraces. Elevation is 3,900 to 4,400 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 120 days.

This unit is 55 percent Trocken very stony sandy loam, 4 to 15 percent slopes, and 30 percent Badland. The Trocken soil is on alluvial fans and terraces, and Badland is on eroded side slopes. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Bluewing soils near drainageways, Stumble soils on alluvial fan skirts, Bundorf soils on higher remnants of alluvial fans, and Kayo soils on north- or east-facing slopes of alluvial fans. The unit is about 5 percent Bluewing soils, 4 percent Stumble soils, 3 percent Bundorf soils, and 3 percent Kayo soils.

The Trocken soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is pale brown very stony sandy loam about 3 inches thick. The substratum to a depth of 60 inches or more is brown, stratified very cobbly loam to extremely gravelly loamy coarse sand.

Permeability of the Trocken soil is moderate. 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 slight. The soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks.

Badland consists of highly weathered water-laid tuff, diatomaceous earth, siltstone, and sandstone. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

This unit is used as rangeland.

The present vegetation in most areas of the Trocken soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by the very low precipitation and low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because the precipitation is very low.

The duration and intensity of grazing should be adjusted to season of growth and to precipitation. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

The main limitations to use of this soil as sites for roads are flooding and steepness of slope. Roads should be provided with drainage and should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The soil in this unit is in capability subclass VIIs, nonirrigated.

1363—Trocken very stony sandy loam, 4 to 8 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 3,900 to 4,400 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is pale brown very stony sandy loam about 3 inches thick. The subsoil is brown gravelly sandy loam about 4 inches thick. The substratum to a depth of 60 inches or more is brown, stratified very cobbly loam to extremely gravelly loamy coarse sand.

Included in this unit are Bluewing soils in drainageways, Stumble soils on alluvial fan skirts, Isolde soils on sand dunes, and Toulon soils on shoreline terraces. The unit is about 3 percent Bluewing soils, 4 percent Stumble soils, 4 percent Isolde soils, and 4 percent Toulon soils.

Permeability of this Trocken soil is moderate. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used as rangeland.

The present vegetation in most areas of the Trocken soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by the very low precipitation and low available water capacity. This soil is rated as very poorly suited to rangeland seeding, mainly because precipitation is very low.

Grazing should be adjusted to season of growth and to precipitation. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

Flooding is a moderate limitation to use of this soil as sites for roads. Roads should be provided with drainage.

This soil is in capability subclass VIIs, nonirrigated.

1364—Trocken-Wrango complex, 4 to 30 percent slopes. This map unit is on alluvial fans and terraces. Elevation is 3,900 to 5,600 feet. The average annual precipitation is 6 to 8 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 120 days.

This unit is 50 percent Trocken very stony sandy loam, 8 to 30 percent slopes, and 35 percent Wrango gravelly loamy sand, 4 to 8 percent slopes. The Trocken soil is on dissected alluvial fans, and the Wrango soil is on tops of terraces. Areas of these soils are so intricately intermingled that it is not practical to map them separately at the scale used.

Included in this unit are Bluewing soils near drainageways, Stumble soils on alluvial fan skirts, Bundorf soils on higher remnants of alluvial fans, and Kayo soils on north- or east-facing slopes of alluvial fans. The unit is about 5 percent Bluewing soils, 4 percent Stumble soils, 3 percent Bundorf soils, and 3 percent Kayo soils.

The Trocken soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is pale brown very stony sandy loam about 3 inches thick. The underlying material to a depth of 60 inches or more is brown, stratified very cobbly loam to extremely gravelly loamy coarse sand.

Permeability of the Trocken soil is moderate. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity.

The Wrango soil is very deep and excessively drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown gravelly loamy sand about 2 inches thick. The upper 6 inches of the underlying material is pale brown gravelly sand. The lower part to a depth of 60 inches is light gray extremely gravelly loamy coarse sand.

Permeability of the Wrango 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 slight. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used as rangeland.

The present vegetation in most areas of the Trocken soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by the very low precipitation and low available water capacity. This soil is rated as very poorly suited to rangeland seeding, mainly because precipitation is very low.

The present vegetation in most areas of the Wrango soil is mainly spiny hopsage, big sagebrush, and Indian ricegrass. The production of forage is limited by the very low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation and the very low available water capacity of the surface layer.

The duration and intensity of grazing should be adjusted to season of growth and to precipitation. To insure uniform grazing, salt blocks should be placed in less accessible areas rather than near water or in easily accessible areas.

The main limitations to use of this unit as sites for roads are the steepness of slope of the Trocken soil and flooding and stones of the Wrango soil. Roads should be provided with drainage and should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Suitable material should be added to provide an adequate wearing surface.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1370—Singatse-Fireball-Rednik association. This map unit is on uplands and alluvial fans. Elevation is 4,400 to 5,400 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 40 percent Singatse very gravelly sandy loam, 8 to 30 percent slopes; 25 percent Fireball extremely stony fine sandy loam, 30 to 50 percent slopes; and 20 percent Rednik very stony sandy loam, 4 to 15 percent slopes. The Singatse soil is on eroded, rounded hillcrests and side slopes. The Fireball soil is on slightly concave colluvial slopes. The Rednik soil is on alluvial fans adjacent to drainageways.

Included in this unit are Stumble soils on alluvial fan skirts, Bluewing soils on alluvial fans near mouths of canyons, and Rock outcrop as peaks or rims. The unit is about 5 percent Stumble soils, 5 percent Bluewing soils, and 5 percent Rock outcrop.

The Singatse soil is very shallow and somewhat excessively drained. It formed in residuum derived dominantly from basalt and rhyolite. Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is pale brown, very gravelly sandy loam about 2 inches thick. The upper 4 inches of the underlying material is pale brown very gravelly sandy loam. The lower part to a depth of 12 inches is highly weathered bedrock. Hard bedrock is at a depth of 12 inches. Depth to weathered bedrock ranges from 4 to 10 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Singatse soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Fireball soil is deep and well drained. It formed in residuum derived dominantly from basalt. Typically, 15 to 25 percent of the surface is covered with stones. The

surface layer is light brownish gray extremely stony fine sandy loam about 3 inches thick. The subsoil is light yellowish brown very cobbly loam about 21 inches thick. The substratum is white extremely cobbly loam about 23 inches thick over hard basalt bedrock. Depth to hard basalt bedrock ranges from 40 to 60 inches.

Permeability of the Fireball soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Rednik soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is pale brown very stony sandy loam about 6 inches thick. The subsoil is brown very gravelly sandy clay loam about 14 inches thick. The substratum to a depth of 60 inches or more is pinkish gray very gravelly sandy loam.

Permeability of the Rednik soil is moderately slow. 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 slight. This soil is subject to flash flooding during storms of unusually high intensity.

This unit is used as rangeland.

The present vegetation in most areas of the Singatse soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by the very low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, very low available water capacity of the surface layer, and shallowness of the root zone.

The present vegetation in most areas of the Fireball soil is mainly Bailey greasewood, shadscale, and bud sagebrush. The production of forage is limited by very low precipitation. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, steepness of slope, and large stones on the surface.

The present vegetation in most areas of the Rednik soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by the very low precipitation and very low available water capacity. The suitability of this soil for rangeland seeding is very poor, mainly because of very low precipitation and very low available water capacity of the surface layer.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of this unit as sites for roads are steepness of slope of all the soils, depth to rock of the Singatse soil, and flooding and large stones of the Rednik soil. Roads should be provided with an adequate wearing surface and drainage and should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided becaue of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1371—Singatse-Flex-Acrelane association. This map unit is on uplands. Elevation is 5,000 to 6,000 feet. The average annual precipitation is 6 to 10 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 30 percent Singatse very gravelly sandy loam, 8 to 30 percent slopes; 30 percent Flex very gravelly sandy loam, 15 to 50 percent slopes; and 25 percent Acrelane very stony loam, 15 to 50 percent slopes. The Singatse soil is on eroded, rounded hillcrests on south- and west-facing slopes. The Flex soil is on east- and north-facing slopes. The Acrelane soil is on peaks and ridges near granitic Rock outcrop.

Included in this unit are Old Camp soils on ridges, Stingdorn soils on small plateaus, and Rock outcrop as peaks and rims. The unit is about 5 percent Old Camp soils, 5 percent Stingdorn soils, and 5 percent Rock outcrop.

The Singatse soil is very shallow and somewhat excessively drained. It formed in residuum derived dominantly from basalt and rhyolite. Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is pale brown very gravelly sandy loam about 6 inches thick. The underlying material to a depth of 12 inches is highly weathered bedrock. Hard bedrock is at a depth of 12 inches. Depth to weathered bedrock ranges from 4 to 10 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Singatse soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Flex soil is shallow and well drained. It formed in residuum derived dominantly from altered andesite and metavolcanic rocks. Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is light brownish gray very gravelly sandy loam about 3 inches thick. The subsoil is brown very gravelly sandy clay loam about 7 inches thick. Highly weathered metavolcanic bedrock is at a depth of 10 inches. Depth to weathered bedrock ranges from 6 to 12 inches.

Permeability of the Flex soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 12 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Acrelane soil is shallow and well drained. It formed in residuum derived dominantly from granitic rock. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 6 inches thick. The subsoil is brown very

gravelly coarse sandy loam about 4 inches thick. Weathered granodiorite is at a depth of 10 inches. Depth to weathered bedrock ranges from 10 to 20 inches.

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

This unit is used as rangeland.

The present vegetation in most areas of the Singatse soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by the very low precipitation, very low available water capacity, and shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, the very low available water capacity of the surface layer, and the shallowness of the root zone.

The present vegetation in most areas of the Flex soil is mainly big sagebrush, green ephedra, and cheatgrass. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, steepness of slope, and the shallowness of the root zone.

The present vegetation in most areas of the Acrelane soil is mainly big sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by the very low available water capacity and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity, steepness of slope, and the shallowness of the root zone. If this unit is used for timber production, a mature stand of trees (80 to 100 years) will yield about 4 to 8 cords of wood per acre.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The main limitations to use of this unit as sites for roads are the steepness of slope and depth to bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1372—Singatse-Isolde association. This map unit is on uplands. Elevation is 4,400 to 5,000 feet. The average annual precipitation is 4 to 6 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 50 percent Singatse very gravelly sandy loam, 8 to 30 percent slopes, and 35 percent Isolde fine sand, 0 to 15 percent slopes. The Singatse soil is on rounded hillcrests and side slopes. The Isolde soil is on sand dunes superimposed over the Singatse soil.

Included in this unit are Rock outcrop as peaks and rims, Fireball soils on lower colluvial slopes, Rezave soils on small plateaus, and Trocken soils along drainageways. The unit is about 5 percent Rock outcrop, 4 percent Fireball soils, 3 percent Rezave soils, and 3 percent Trocken soils.

The Singatse soil is very shallow and somewhat excessively drained. It formed in residuum derived dominantly from basalt and rhyolite. Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is pale brown very gravelly sandy loam about 2 inches thick. The upper 4 inches of the underlying material is pale brown very gravelly sandy loam. The lower part to a depth of 12 inches is highly weathered bedrock. Hard bedrock is at a depth of 12 inches. Depth to weathered bedrock ranges from 4 to 10 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Singatse soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Isolde soil is very deep and excessively drained. It formed in wind-reworked sand derived from mixed rock sources. Slopes are 0 to 15 percent. Typically, the surface layer is light brownish gray fine sand about 6 inches thick. The underlying material to a depth of 60 inches is light brownish gray fine sand.

Permeability of the Isolde soil is very 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 unit is used as rangeland.

The present vegetation in most areas of the Singatse soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by the very low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, the very low available water capacity of the surface layer, and the shallowness of the root zone.

The present vegetation in most areas of the Isolde soil is mainly spiny hopsage, hairy horsebrush, and Indian ricegrass. The production of forage is limited by the very low precipitation and low available water capacity. The suitability of this soil for rangeland seeding is very poor because of the very low precipitation and very low available water capacity of the surface layer.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Livestock should be managed so that enough vegetation is left to

protect the unit from excessive erosion. The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of this unit as sites for roads are the steepness of slope and shallowness over bedrock of the Singatse soil. Roads should be located in areas of the Isolde soil if feasible.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1373—Singatse-Mizel-Stingdorn association. This map unit is on uplands. Elevation is 4,400 to 6,400 feet. The average annual precipitation is 5 to 9 inches, the average annual air temperature is 48 to 51 degrees F, and the average frost-free period is 90 to 120 days.

This unit is 50 percent Singatse very gravelly sandy loam, 8 to 30 percent slopes; 20 percent Mizel very gravelly coarse sandy loam, 15 to 50 percent slopes; and 15 percent Stingdorn extremely stony loam, 15 to 30 percent slopes. The Singatse soil is on eroded, slightly convex, south- and west-facing slopes. The Mizel soil is on rounded tops and north- and east-facing slopes. The Stingdorn soil is on tilted plateaus.

Included in this unit are Fireball soils on colluvial slopes near drainageways, Hefed soils on north-facing colluvial slopes, Zephan soils on smooth north- and east-facing slopes at higher elevations, and Rock outcrop as peaks and rims. The unit is about 5 percent Fireball soils, 3 percent Hefed soils, 3 percent Zephan soils, and 4 percent Rock outcrop.

The Singatse soil is shallow and somewhat excessively drained. It formed in residuum derived dominantly from basalt and rhyolite. Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is pale brown very gravelly sandy loam about 2 inches thick. The upper 4 inches of the underlying material is pale brown very gravelly sandy loam. The lower part to a depth of 12 inches is highly weathered bedrock. Hard bedrock is at a depth of 12 inches. Depth to weathered bedrock ranges from 4 to 10 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Singatse soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Mizel soil is very shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, 50 to 60 percent of the surface is covered with gravel. The surface layer is very pale brown very gravelly coarse sandy loam about 3 inches thick. Hard rhyolitic bedrock is at a depth of 3 inches. Depth to bedrock ranges from 3 to 10 inches.

Permeability of the Mizel soil is moderate. Available water capacity is very low. Effective rooting depth is 3 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Stingdorn soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is pale brown extremely stony loam about 4 inches thick. The subsoil is yellowish brown very gravelly clay loam about 5 inches thick. The upper 3 inches of the substratum is pale brown very gravelly sandy loam. The lower part to a depth of 13 inches is an indurated silica-cemented hardpan. Rhyolitic bedrock is at a depth of 13 inches. Depth to bedrock ranges from 8 to 20 inches.

Permeability of the Stingdorn soil is moderately 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 slight.

This unit is used as rangeland.

The present vegetation in most areas of the Singatse soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by the very low precipitation, very low available water capacity, and shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, very low available water capacity of the surface layer, and shallowness of the root zone.

The present vegetation in most areas of the Mizel soil is mainly low sagebrush and bottlebrush squirreltail. The production of forage is limited by the low precipitation, very low available water capacity, and shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, steepness of slope, and the shallowness of the root zone over bedrock.

The present vegetation in most areas of the Stingdorn soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation, very low available water capacity, and shallowness of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor because of the very low available water capacity of the surface layer, very low precipitation, and the shallowness of the root zone.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of this unit as sites for roads are the steepness of slope and restricted depth to bedrock of all three soils. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1374—Singatse-Fireball-Osobb association. This map unit is on uplands. Elevation is 4,400 to 6,000 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 40 percent Singatse very gravelly sandy loam, 8 to 30 percent slopes; 25 percent Fireball extremely stony fine sandy loam, 30 to 50 percent slopes; and 20 percent Osobb extremely stony fine sandy loam, 8 to 30 percent slopes. The Singatse soil is on convex south- and west-facing slopes. The Fireball soil is on colluvial slopes near drainageways. The Osobb soil is on smooth slopes and slightly convex slopes.

Included in this unit are Bombadil soils on eroded north- and east-facing slopes, Trocken soils in canyon bottoms and on short alluvial fans, Hefed soils on north-facing colluvial slopes, and Rock outcrop on rims and peaks. The unit is about 5 percent Bombadil soils, 3 percent Trocken soils, 3 percent Hefed soils, and 4 percent Rock outcrop.

The Singatse soil is very shallow and somewhat excessively drained. It formed in residuum derived dominantly from basalt and rhyolite. Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is pale brown very gravelly sandy loam about 2 inches thick. The upper 4 inches of the underlying material is pale brown very gravelly sandy loam. The lower part to a depth of 12 inches is highly weathered bedrock. Hard bedrock is at a depth of 12 inches. Depth to weathered bedrock ranges from 4 to 10 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Singatse soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Fireball soil is deep and well drained. It formed in residuum derived dominantly from basalt. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is light brownish gray extremely stony fine sandy loam about 3 inches thick. The subsoil is light yellowish brown very cobbly loam about 21 inches thick. The substratum is white very cobbly loam about 23 inches thick over hard basalt bedrock. Depth to hard basalt bedrock ranges from 40 to 60 inches.

Permeability of the Fireball soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Osobb soil is shallow and well drained. It formed in residuum of volcanic rocks. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is light brownish gray extremely stony fine sandy loam about 2 inches thick. The subsoil is pale brown very gravelly loam about 9 inches thick. The substratum is a very pale brown indurated hardpan about 2 inches thick over weathered rock. Weathered rock is at a depth of 13 inches. Depth to the hardpan ranges from 8 to 20 inches.

Permeability of the Osobb soil is moderately rapid. 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 slight.

This unit is used as rangeland.

The present vegetation in most areas of the Singatse soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by very low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, because of the very low precipitation, very low available water capacity of the surface layer, and shallowness of the root zone.

The present vegetation in most areas of the Fireball soil is mainly Bailey greasewood, shadscale, and bud sagebrush. The production of forage is limited by the very low precipitation. The suitability of this soil for rangeland seeding is very poor, because of the very low precipitation, steepness of slope, and large stones on the surface.

The present vegetation in most areas of the Osobb soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor because of the very low precipitation, very low available water capacity of the surface layer, large stones on the surface, and shallowness of the root zone.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. The intensity and duration of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of this unit as sites for roads are steepness of slope, stones, and restricted depth to bedrock. Roads should be provided with an adequate wearing surface and located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1380—Stingdorn-Singatse-Rock outcrop association. This map unit is on uplands. Elevation is 4,400 to 6,000 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 50 degrees F, and the average frost-free period is 100 to 110 days.

This unit is 35 percent Stingdorn extremely stony loam, 15 to 30 percent slopes; 35 percent Singatse very gravelly sandy loam, 15 to 30 percent slopes; and 15 percent Rock outcrop. The Stingdorn soil is on smooth

upland slopes and plateaus; the Singatse soil is on eroded, rounded hillcrests and side slopes; and the Rock outcrop is on ridges and peaks.

Included in this unit are Fireball soils on slightly concave colluvial slopes, Yuko soils on smooth east- and north-facing slopes, and Rezave soils on the tops of plateaus. The unit is about 5 percent Fireball soils, 7 percent Yuko soils, and 3 percent Rezave soils.

The Stingdorn soil is shallow and well drained. It formed in residuum derived dominantly from rhyolite. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is pale brown extremely stony loam about 4 inches thick. The subsoil is yellowish brown very gravelly clay loam about 5 inches thick. The upper 3 inches of the substratum is pale brown very gravelly sandy loam. The lower part to a depth of 13 inches is an indurated silica-cemented hardpan. Rhyolitic bedrock is at a depth of 13 inches. Depth to bedrock ranges from 8 to 20 inches.

Permeability of the Stingdorn soil is moderately 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 slight.

The Singatse soil is very shallow and somewhat excessively drained. It formed in residuum of basalt and rhyolite. Typically, 35 to 60 percent of the surface is covered with gravel. The surface layer is light brownish gray very gravelly sandy loam about 2 inches thick. The underlying material is light gray very gravelly loam about 4 inches thick. Below that is highly weathered bedrock about 6 inches thick. Hard bedrock is at a depth of 12 inches. Depth to weathered bedrock ranges from 4 to 10 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Singatse soil is moderate. Available water capacity is very low. Effective rooting depth is 4 to 10 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of altered volcanic rocks as peaks and ridges.

This unit is used as rangeland.

The present vegetation in most areas of the Stingdorn soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation, very low available water capacity, and shallowness of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, very low precipitation, and the shallowness of the root zone.

The present vegetation in most areas of the Singatse soil is mainly shadscale, bud sagebrush, and bottlebrush squirreltail. The production of forage is limited by the very low precipitation, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low precipitation, very low available water capacity of the surface layer, and shallowness of the root zone.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of this unit as sites for roads are steepness of slope and shallowness of the soils over bedrock. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1390—Pirouette-Osobb-Rock outcrop association. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 5 to 7 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 40 percent Pirouette very stony very fine sandy loam, 0 to 8 percent slopes; 40 percent Osobb very stony very fine sandy loam, 8 to 30 percent slopes; and 10 percent Rock outcrop. The Pirouette soil is on smooth tops and small plateaus. The Osobb soil is on slightly convex slopes. Rock outcrop is on ridges or small peaks.

Included in this unit are Xman soils near Rock outcrop on north- and east-facing slopes, Fireball soils on slightly concave colluvial slopes, and Singatse soils on rounded ridges and on eroded slopes. The unit is about 4 percent Xman soils, 3 percent Fireball soils, and 3 percent Singatse soils.

The Pirouette soil is shallow and well drained. It formed in residuum derived dominantly from basalt and tuff. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is pale brown very stony very fine sandy loam about 3 inches thick. The subsoil is light brown very cobbly clay loam about 7 inches thick. The upper 5 inches of the substratum is light brown very cobbly sandy loam. The lower part to a depth of 15 inches is a silica-cemented hardpan. Unweathered bedrock is at a depth of 16 inches. Depth to the hardpan ranges from 11 to 20 inches.

Permeability of the Pirouette soil is moderately slow. Available water capacity is very low. Effective rooting depth is 11 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Osobb soil is shallow and well drained. It formed in residuum of volcanic rocks. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is light brownish gray very stony very fine sandy loam about 4 inches thick. The subsoil is pale brown very cobbly very fine sandy loam about 13 inches thick. The substratum is an indurated hardpan about 1 inch thick

over bedrock. Depth to the hardpan ranges from 8 to 20 inches.

Permeability of the Osobb 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 slight.

Rock outcrop consists of exposed areas of basalt or tuff as ridges or peaks.

This unit is used as rangeland.

The present vegetation in most areas of the Pirouette soil is mainly Bailey greasewood, shadscale, and bud sagebrush. The production of forage is limited by the very low precipitation, very low available water capacity, and shallowness of the root zone over the hardpan. The suitability of this soil for rangeland seeding is very poor because of the very low precipitation, very low available water capacity of the surface layer, large stones on the surface, and shallowness of the root zone.

The present vegetation in most areas of the Osobb soil is mainly Bailey greasewood, shadscale, and Indian ricegrass. The production of forage is limited by the very low precipitation, very low available water capacity, and shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor because of the very low precipitation, very low available water capacity of the surface layer, large stones on the surface, and shallowness of the root zone.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. The duration and intensity of grazing should be adjusted to season of growth and to precipitation.

The main limitations to use of this unit as sites for roads are depth to bedrock of both soils and steepness of slope and stones of the Osobb soil. Suitable material should be added to provide an adequate wearing surface. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1400—Softscrabble-Gabica-Burnborough association. This map unit is on uplands. Elevation is 6,000 to 7,500 feet. The average annual precipitation is 12 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 50 to 80 days.

This unit is 30 percent Softscrabble very stony loam, 15 to 50 percent slopes; 30 percent Gabica very cobbly sandy loam, 8 to 30 percent slopes; and 25 percent Burnborough stony loam, 15 to 50 percent slopes. The Softscrabble soil is on concave side slopes of hills. The Gabica soil is on ridges and tops. The Burnborough soil is on colluvial slopes.

Included in this unit are Ticino soils, which support mountainmahogany and are near rimrocks and on ridges; Thulepah soils on higher north-facing slopes; Barshaad soils at lower elevations on flat and slightly concave slopes; and Rock outcrop on rims and small peaks. The unit is about 4 percent Ticino soils, 4 percent Thulepah soils, 3 percent Barshaad soils, and 4 percent Rock outcrop.

The Softscrabble soil is very deep and well drained. It formed in residuum and colluvium derived dominantly from basalt. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is dark brown very stony loam about 9 inches thick. The upper 21 inches of the subsoil is brown very cobbly clay loam and extremely cobbly clay loam. The lower 48 inches is yellowish brown clay loam, gravelly clay loam, and loam. Highly weathered soft bedrock is at a depth of 78 inches. Depth to weathered bedrock is more than 60 inches.

Permeability of the Softscrabble 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 slight.

The Gabica soil is shallow and well drained. It formed in residuum of volcanic rocks. Typically, 35 to 50 percent of the surface is covered with cobbles. The surface layer is dark grayish brown very cobbly sandy loam about 14 inches thick. The subsoil is dark yellowish brown very gravelly clay loam about 5 inches thick. Fractured unweathered bedrock is at a depth of 19 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Gabica soil is moderately 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 slight.

The Burnborough soil is very deep and well drained. It formed in residuum and colluvium derived dominantly from andesite and rhyolite. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is dark grayish brown stony loam about 17 inches thick. The subsoil is yellowish brown very gravelly loam about 43 inches thick.

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

This unit is used as rangeland.

The present vegetation in most areas of the Softscrabble soil is mainly big sagebrush, antelope bitterbrush, and Idaho fescue. The production of forage is limited by the short growing season and cold temperatures in spring. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope and large stones on the surface.

The present vegetation in most areas of the Gabica soil is mainly low sagebrush, Douglas rabbitbrush, and

Thurber needlegrass. The production of forage is limited by the short growing season and cold temperatures in spring, very low available water capacity, and shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity of the surface layer, large stones on the surface, and shallowness of the root zone.

The present vegetation in most areas of the Burnborough soil is mainly big sagebrush, gray horsebrush, and Idaho fescue. The production of forage is limited by the short growing season and cold temperatures in spring. The suitability of this soil for rangeland seeding is very poor, mainly because of steepness of slope.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Cold soil temperatures delay plant growth and readiness for grazing. Grazing should be delayed until the soils are warm and the plants have achieved sufficient growth. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion. Clearing of brush would encourage the growth of desirable forage grasses.

The main limitations to use of this unit as sites for roads are the steepness of slope of all the soils and the shallowness over bedrock of the Gabica soil. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1401—Softscrabble-Gabica-Sumine association. This map unit is on mountainous uplands. Elevation is 6,000 to 7,900 feet. The average annual precipitation is 12 to 18 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 70 to 90 days.

This unit is 35 percent Softscrabble very stony loam, 15 to 50 percent slopes; 25 percent Gabica very cobbly sandy loam, 8 to 30 percent slopes; and 25 percent Sumine very stony loam, 30 to 50 percent slopes. The Softscrabble soil is on concave slopes in snowpockets. The Gabica soil is on windswept ridges and peaks. The Sumine soil is near Rock outcrop and on convex slopes.

Included in this unit are Ticino soils, which are near rims and support mountainmahogany; Duco soils on lower, south-facing ridges; Burnborough soils on colluvial slopes near drainageways; soils similar to Blackwell soils near springs and wet seeps; and Rock outcrop on peaks and rims. The unit is about 3 percent Ticino soils, 3 percent Duco soils, 3 percent Burnborough soils, 1 percent soils similar to Blackwell soils, and 5 percent Rock outcrop.

The Softscrabble soil is very deep and well drained. It formed in residuum and colluvium derived dominantly from basalt. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is dark brown very stony loam about 9 inches thick. The upper 21 inches of the subsoil is brown very cobbly clay loam. The lower 48 inches is yellowish brown clay loam. Highly weathered soft bedrock is at a depth of 78 inches. Depth to weathered bedrock is more than 60 inches.

Permeability of the Softscrabble 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 slight.

The Gabica soil is shallow and well drained. It formed in residuum of volcanic rocks. Typically, 35 to 55 percent of the surface is covered with cobbles. The surface layer is dark grayish brown very cobbly sandy loam about 14 inches thick. The subsoil is dark yellowish brown very gravelly clay loam about 5 inches thick. Fractured unweathered bedrock is at a depth of 19 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Gabica soil is moderately 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 slight.

The Sumine soil is moderately deep and well drained. It formed in residuum and colluvium from mixed rocks. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is brown very stony loam about 6 inches thick. The subsoil is brown very cobbly clay loam about 28 inches thick over hard bedrock. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Sumine soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as rangeland.

The present vegetation in most areas of the Softscrabble soil is mainly big sagebrush, antelope bitterbrush, and Idaho fescue. The production of forage is limited by the short growing season and cold temperatures in spring. The suitability of this soil for rangeland seeding is very poor, mainly because of steepness of slope and large stones on the surface.

The present vegetation in most areas of the Gabica soil is mainly low sagebrush, Douglas rabbitbrush, and Thurber needlegrass. The production of forage is limited by the short growing season and cold temperatures in spring, the very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor. The main limitations to seeding are the very low available water capacity, the large stones on the surface, and the shallowness of the root zone.

The present vegetation in most areas of the Sumine soil is mainly big sagebrush, antelope bitterbrush, and bluebunch wheatgrass. The production of forage is limited by the low available water capacity, short growing season and cold temperatures in spring, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of steepness of slope.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Cold soil temperatures delay plant growth and readiness for grazing. Therefore, grazing should be delayed until the soils are warm and the plants have achieved sufficient growth.

The main limitations to use of this unit as sites for roads are steepness of slope of all the soils and shallowness over bedrock of the Gabica soil. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1410—Burnborough-Ticino-Gabica association. This map unit is on uplands. Elevation is 6,000 to 7,500 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 50 to 80 days.

This unit is 35 percent Burnborough very gravelly loam, 15 to 50 percent slopes; 30 percent Ticino gravelly fine sandy loam, 4 to 30 percent slopes; and 20 percent Gabica very cobbly sandy loam, 8 to 30 percent slopes. The Burnborough soil is on colluvial slopes. The Ticino soil is on lower ridges and near rimrocks. The Gabica soil is on high, windswept tops and ridges.

Included in this unit are Softscrabble soils in concave snowpockets, Barshaad soils at lower elevations on flat and slightly concave slopes, and Rock outcrop on peaks and ridges. The unit is about 6 percent Softscrabble soils, 4 percent Barshaad soils, and 5 percent Rock outcrop.

The Burnborough soil is very deep and well drained. It formed in residuum and colluvium derived dominantly from andesite and rhyolite. Slope is 15 to 50 percent. Typically, 35 to 50 percent of the surface is covered with gravel. The surface layer is dark grayish brown very gravelly loam about 17 inches thick. The subsoil is yellowish brown very gravelly loam about 43 inches thick.

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

The Ticino soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from andesite, rhyolite, and metasedimentary rocks. Typically, 15 to 35 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly fine sandy loam about 11 inches thick. The subsoil is brown gravelly loam about 11 inches thick. Highly weathered bedrock is at a depth of 22 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Ticino soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Gabica soil is shallow and well drained. It formed in residuum of volcanic rocks. Typically, 35 to 55 percent of the surface is covered with cobbles. The surface layer is dark grayish brown very cobbly sandy loam about 14 inches thick. The subsoil is dark yellowish brown very gravelly clay loam about 5 inches thick. Fractured unweathered bedrock is at a depth of 19 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Gabica soil is moderately 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 slight.

This unit is used as rangeland.

The present vegetation in most areas of the Burnborough soil is mainly big sagebrush, gray horsebrush, and Idaho fescue. The production of forage is limited by the short growing season and cold temperatures in spring. The suitability of this soil for rangeland seeding is poor, mainly because of steepness of slope.

The present vegetation in most areas of the Ticino soil is mainly mountainmahogany, big sagebrush, and arrowleaf balsamroot. The production of forage is limited by the low available water capacity and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is fair because of competition of the trees, low available water capacity, and the restricted depth of the root zone.

The present vegetation in most areas of the Gabica soil is mainly low sagebrush, Douglas rabbitbrush, and Thurber needlegrass. The production of forage is limited by the short growing season and cold temperatures in spring, very low available water capacity, and the shallowness of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor because of the very low available water capacity of the surface layer and the restricted depth of the root zone.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Cold soil temperatures delay plant growth and readiness for grazing. Therefore, grazing should be delayed until the soils are warm and the plants have achieved sufficient growth. Clearing of brush would encourage the growth of desirable forage grasses.

The main limitations to use of this unit as sites for roads are steepness of slope of all the soils and the shallowness over bedrock of the Gabica soil. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided because of the underlying bedrock.

The Ticino soil is in capability subclass VIe, nonirrigated. The Sumine and Gabica soils are in capability subclass VIIs, nonirrigated.

1411—Burnborough-Ticino-Softscrabble association. This map unit is on uplands. Elevation is 6,000 to 7,500 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 50 to 80 days.

This unit is 35 percent Burnborough very gravelly loam, 15 to 50 percent slopes; 30 percent Ticino gravelly fine sandy loam, 4 to 30 percent slopes; and 20 percent Softscrabble very stony loam, 15 to 50 percent slopes. The Burnborough soil is on colluvial slopes. The Ticino soil is on ridges and near rimrocks. The Softscrabble soil is in concave snowpockets.

Included in this unit are Thulepah soils on higher, north-facing slopes; Barshaad soils at lower elevations on flat and slightly concave slopes; and Rock outcrop on peaks and ridges. The unit is about 5 percent Thulepah soils, 5 percent Barshaad soils, and 5 percent Rock outcrop.

The Burnborough soil is very deep and well drained. It formed in residuum and colluvium derived dominantly from andesite and rhyolite. Typically, 30 to 55 percent of the surface is covered with gravel. The surface layer is dark grayish brown very gravelly loam about 17 inches thick. The subsoil is yellowish brown very gravelly loam about 43 inches thick.

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

The Ticino soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from andesite, rhyolite, and metamorphic rocks. Typically, 10 to 20 percent of the surface is covered with gravel. The surface layer is grayish brown gravelly fine sandy loam about 11 inches thick. The subsoil is brown gravelly loam about 11 inches thick. Highly weathered bedrock is at a depth of 22 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Ticino soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Softscrabble soil is very deep and well drained. It formed in residuum and colluvium derived dominantly from basalt. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is dark brown very stony loam about 9 inches thick. The upper 21 inches of the subsoil is brown very cobbly clay loam. The lower 48 inches is yellowish brown clay loam. Highly weathered soft bedrock is at a depth of 78 inches. Depth to weathered bedrock is more than 60 inches.

Permeability of the Softscrabble 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 slight.

This unit is used as rangeland.

The present vegetation in most areas of the Burnborough soil is mainly big sagebrush, gray horsebrush, and Idaho fescue. The production of forage suitable for livestock grazing is limited by the short growing season and cold temperatures in spring. The suitability of this soil for rangeland seeding is poor, mainly because of the steepness of slope.

The present vegetation in most areas of the Ticino soil is mainly mountainmahogany, big sagebrush, and arrowleaf balsamroot. The production of forage is limited by low available water capacity and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is fair. The main limitations to seeding are competition of the trees, low available water capacity, and the restricted depth of the root zone.

The present vegetation in most areas of the Softscrabble soil is mainly big sagebrush, antelope bitterbrush, and Idaho fescue. The production of forage is limited by the short growing season and cold temperatures in spring. The suitability of this soil for rangeland seeding is very poor, mainly because of the steepness of slope and the large stones on the surface.

Steepness of slope limits access by livestock and promotes overgrazing of less sloping areas. Cold soil temperatures delay plant growth and readiness for grazing. Grazing should be delayed until the soils are warm and the plants have achieved sufficient growth. Livestock should be managed so that enough vegetation is left to protect the unit from excessive erosion. Clearing of brush would encourage the growth of desirable forage grasses.

The main limitation to use of this unit as sites for roads is steepness of slope. Roads should be located in less sloping areas, if feasible, to minimize cutting and filling and to reduce erosion.

The Ticino soil is in capability subclass VIe, nonirrigrated. The Softscrabble and Burnborough soils are in capability subclass VIIs, nonirrigated.

1420—Barshaad-Fugawee-Duckhill Variant association. This map unit is on mountainous uplands. Elevation is 6,000 to 8,000 feet. The average annual precipitation is 14 to 35 inches, the average annual air

temperature is 41 to 44 degrees F, and the average frost-free period is 68 to 80 days.

This unit is 35 percent Barshaad very stony loam, 2 to 15 percent slopes; 30 percent Fugawee stony sandy loam, 15 to 50 percent slopes; and 20 percent Duckhill Variant very stony sandy loam, 30 to 70 percent slopes. The Barshaad soil is on tops and plateau remnants at lower elevations. The Fugawee soil is on smooth, slightly convex slopes. The Duckhill Variant soil is adjacent to and on ridges.

Included in this map unit are Ticino soils, which support mountainmahogany and are on ridges and plateau rims; Jumbo soils on lower, colluvial, north-facing slopes; and Rock outcrop on peaks and ridges. The unit is about 5 percent Ticino soils, 5 percent Jumbo soils, and 5 percent Rock outcrop.

The Barshaad soil is moderately deep and well drained. It formed in residuum dominantly of metavolcanic and metasedimentary rock. Typically, 3 to 15 percent of the surface is covered with stones and some cobbles. The surface layer is grayish brown very stony loam about 1 inch thick. The subsoil is brown gravelly clay about 23 inches thick. Weathered bedrock is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Barshaad soil is very slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Fugawee soil is moderately deep and well drained. It formed in residuum dominantly of volcanic rock. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is pale brown stony sandy loam about 17 inches thick. The subsoil is pale brown gravelly clay loam about 20 inches thick. Highly weathered volcanic rock is at a depth of 37 inches. Depth to highly weathered volcanic rock ranges from 20 to 40 inches.

Permeability of the Fugawee soil is moderately slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. The Fugawee soil in this unit is slightly drier than is typical for the Fugawee soils.

The Duckhill Variant soil is shallow and well drained. It formed in residuum dominantly of volcanic rock. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is grayish brown very stony sandy loam about 8 inches thick. The subsoil is yellowish brown very cobbly clay loam about 5 inches thick. Hard bedrock is at a depth of 13 inches. Depth to bedrock ranges from 4 to 14 inches.

Permeability of the Duckhill Variant soil is moderately slow. Available water capacity is very low. Effective rooting depth is 4 to 14 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as woodland and rangeland.

The present vegetation on the Barshaad soil in most areas is mainly low sagebrush, littleleaf horsebrush, and bottlebrush squirreltail. The production of forage is limited by moderately low precipitation, very low available water capacity, and the restricted depth of the root zone over bedrock. The suitability of this soil for rangeland seeding is very poor, mainly because of the very low available water capacity. Grazing should be delayed until the soil is firm and the more desirable plants have achieved sufficient growth to withstand grazing pressure.

The present vegetation on the Fugawee soil in most areas is mainly white fir, California red fir, lodgepole pine, and whitebark pine with an understory of snowbrush ceanothus, manzanita, and squawcarpet. This soil is suited to white fir, California red fir, and western white pine. If planted to white fir, the soil can produce about 8,200 cubic feet, or 48,400 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. It can produce about 8,150 cubic feet, or 44,500 board feet (Scribner rule), if planted to California red fir or about 3,100 cubic feet, or 13,100 board feet (Scribner rule), if planted to western white pine. The steepness of slope limits the kind of equipment that can be used in forest management.

The present vegetation on the Duckhill Variant soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and mountainmahogany. In some areas, mostly mountainmahogany grows. The production of merchantable timber is very low, and natural regeneration of trees is difficult because of marginal precipitation, shallowness of soil, and plant competition. If the woodland is to be maintained, only selective harvesting should be practiced. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. The steepness of slope limits the kind of equipment that can be used in forest management. Management that minimizes the risk of erosion is essential to harvesting timber.

The main limitations to use of this soil as sites for roads are the low strength and high clay content of the Barshaad soil, steepness of slope of the Fugawee soil, and shallowness over bedrock and steepness of slope of the Duckhill Variant soil. Suitable base material and an adequate wearing surface are needed. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided in the Duckhill Variant soil because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1430—Fraval-Booford-Jumbo association. This map unit is on mountainous uplands. Elevation is 6,000 to 7,000 feet. The average annual precipitation is 16 to 30 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 50 to 80 days.

This unit is 35 percent Fraval very stony loam, 30 to 50 percent slopes; 30 percent Booford very stony loam, 8 to 30 percent slopes; and 20 percent Jumbo very stony loam, 30 to 50 percent slopes. The Fraval soil is on shoulders of ridges and on convex slopes. The Booford soil is on lower, smooth slopes. The Jumbo soil is on concave lower colluvial slopes that generally face north.

Included in this map unit are Ticino soils, which support mountainmahogany and are near rimrocks; Macareeno soils, which support quaking aspen and are near seeps and streams; Hirschdale soils, which are on higher colluvial slopes generally facing south; and Rock outcrop on peaks and rims. The unit is about 4 percent Ticino soils, 4 percent Macareeno soils, 4 percent Hirschdale soils, and 3 percent Rock outcrop.

The Fraval soil is moderately deep and well drained. It formed in residuum dominantly of volcanic rock. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is dark grayish brown very stony loam about 9 inches thick. The subsoil is brown very gravelly loam about 18 inches thick. Weathered tuff is at a depth of 27 inches. Depth to weathered tuff ranges from 20 to 40 inches.

Permeability of the Fraval soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Booford soil is moderately deep and well drained. It formed in residuum dominantly of andesitic tuff. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 8 inches thick. The subsoil is dark brown clay about 17 inches thick. Weathered andesitic tuff is at a depth of 25 inches. Depth to weathered andesitic tuff ranges from 20 to 40 inches.

Permeability of the Booford soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Jumbo soil is deep and well drained. It formed in residuum and colluvium dominantly of volcanic rock. Slope is 30 to 50 percent. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is dark grayish brown very stony loam about 21 inches thick. The subsoil is brown very cobbly clay loam about 33 inches thick. Weathered tuff is at a depth of 54 inches. Depth to weathered tuff ranges from 40 to 60 inches.

Permeability of the Jumbo soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as woodland and rangeland.

The present vegetation on the Fraval soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and Sandberg bluegrass. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, the soil can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. The steepness of slope limits the kind of equipment that can be used in forest management. Management that minimizes the risk of erosion when harvesting timber is essential.

The present vegetation on the Booford soil in most areas is mainly big sagebrush, antelope bitterbrush, mountainmahogany, and bottlebrush squirreltail. If this soil is managed as rangeland, the production of forage is limited by the moderate available water capacity and the restricted depth of the root zone over bedrock. The soil is rated as poorly suited to rangeland seeding because of the steepness of slope. Cold soil temperature delays plant growth and readiness for grazing; therefore, grazing should be delayed until the soils are warm and the plants have achieved sufficient growth.

The present vegetation on the Jumbo soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and mountainmahogany. In burned or harvested areas, mountainmahogany dominates, especially on north-facing slopes. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, this soil can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. Management that minimizes the risk of erosion is essential. The steepness of slope limits the kind of equipment that can be used in forest management.

The main limitations for the use of the soil as sites for roads are steepness of slope of all the soils and the low strength and high clay content of the Booford soil. Roads should be provided with a stable base and an adequate wearing surface and, if possible, should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1431—Fraval-Hirschdale-Duckhill Variant association. This map unit is on mountainous uplands. Elevation is 6,000 to 7,500 feet. The average annual precipitation is 18 to 45 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 50 to 80 days.

This unit is 35 percent Fraval very stony loam, 30 to 50 percent slopes; 25 percent Hirschdale very stony

loam, 30 to 50 percent slopes; and 25 percent Duckhill Variant very stony sandy loam, 30 to 70 percent slopes. The Fraval soil is on lower east- and north-facing slopes. The Hirschdale soil is on higher, slightly convex slopes. The Duckhill Variant soil is on ridges.

Included in this map unit are Jumbo soils on concave and lower colluvial north-facing slopes; Macareeno soils, which support quaking aspen and are near seeps and streams; Ticino soils, which support mountainmahogany and are near rims; and Rock outcrop on peaks and rims. The unit is about 4 percent Jumbo soils, 4 percent Macareeno soils, 4 percent Ticino soils, and 3 percent Rock outcrop. Also included near the California state line are some soils similar to Fugawee soils that receive slightly less precipitation.

The Fraval soil is moderately deep and well drained. It formed in residuum dominantly of volcanic rock. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is dark grayish brown very stony loam about 9 inches thick. The subsoil is brown very gravelly loam about 18 inches thick. Weathered tuff is at a depth of 27 inches. Depth to weathered tuff ranges from 20 to 40 inches.

Permeability of the Fraval soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Hirschdale soil is moderately deep and well drained. It formed in residuum dominantly of andesite. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 6 inches thick. The subsoil is reddish brown clay about 33 inches thick. Weathered, altered, and bleached andesite is at a depth of 39 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Hirschdale soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Duckhill Variant soil is shallow and well drained. It formed in residuum dominantly of volcanic rock. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is grayish brown very stony sandy loam about 8 inches thick. The subsoil is yellowish brown very cobbly clay loam about 5 inches thick. Hard bedrock is at a depth of 13 inches. Depth to hard bedrock ranges from 4 to 14 inches.

Permeability of the Duckhill Variant soil is moderately slow. Available water capacity is very low. Effective rooting depth is 4 to 14 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as woodland.

The present vegetation on the Fraval soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and Sandberg bluegrass. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, the soil can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. The steepness of slope limits the kind of equipment that can be used in forest management. Management that minimizes the risk of erosion is essential.

The present vegetation on the Hirschdale soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, mountainmahogany, muleears, and squawcarpet. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, this soil can produce about 3,300 cubic feet, or 14,400 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. The steepness of slope limits the kind of equipment that can be used in forest management. Management that minimizes the risk of erosion is essential.

The present vegetation on the Duckhill Variant soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and mountainmahogany. In some areas mountainmahogany is dominant. The production of merchantable timber is very low, and natural regeneration of trees is difficult because of marginal precipitation, shallowness of soil, and plant competition. If the woodland is to be maintained, only selective harvesting should be practiced.

Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees. Management that minimizes the risk of erosion is essential. The steepness of slope limits the kind of equipment that can be used in forest management.

The main limitations to use of this unit as sites for roads are steepness of slope, low strength, and high clay content of the Hirschdale soil; depth to bedrock and steepness of slope of the Duckhill Variant soil; and steepness of slope of the Fraval soil. Suitable base material and an adequate wearing surface are needed. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion. Deep cuts should be avoided in the Duckhill Variant soil because of the underlying bedrock.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1432—Fraval-Hirschdale-Jumbo association. This map unit is on mountainous uplands. Elevation is 6,000 to 7,000 feet. The average annual precipitation is 18 to 45 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 50 to 60 days.

This unit is 35 percent Fraval very stony loam, 30 to 50 percent slopes; 30 percent Hirschdale very stony loam, 15 to 50 percent slopes; and 20 percent Jumbo very stony loam, 30 to 50 percent slopes. The Fraval soil

is on lower east- and north-facing slopes. The Hirschdale soil is at higher elevations on all aspects. The Jumbo soil is on lower colluvial and concave slopes.

Included in this map unit are Boomtown soils on north-facing slopes at higher elevations, Rock outcrop on peaks and ridges, Macareeno soils near seeps and streams, and Booford soils on lower south-facing slopes. The unit is about 5 percent Boomtown soils, 5 percent Rock outcrop, 3 percent Macareeno soils, and 2 percent Booford soils.

The Fraval soil is moderately deep and well drained. It formed in residuum dominantly of volcanic rock. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is dark grayish brown very stony loam about 9 inches thick. The subsoil is brown very gravelly loam about 18 inches thick. Weathered tuff is at a depth of 27 inches. Depth to weathered tuff ranges from 20 to 40 inches.

Permeability of the Fraval soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Hirschdale soil is moderately deep and well drained. It formed in residuum dominantly of andesite. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony loam about 6 inches thick. The subsoil is reddish brown clay about 33 inches thick. Weathered bedrock is at a depth of 39 inches. Depth to weathered bedrock ranges from 20 to 40 inches.

Permeability of the Hirschdale soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Jumbo soil is deep and well drained. It formed in residuum and colluvium dominantly of volcanic rock. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is dark grayish brown very stony loam about 21 inches thick. The subsoil is brown very cobbly clay loam about 33 inches thick. Weathered tuff is at a depth of 54 inches. Depth to weathered tuff ranges from 40 to 60 inches.

Permeability of the Jumbo soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used as woodland.

The present vegetation on the Fraval soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and Sandberg bluegrass. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The present vegetation on the Hirschdale soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, mountainmahogany, muleears, and squawcarpet. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, this soil can produce about 3,300 cubic feet, or 14,400 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The present vegetation on the Jumbo soil in most areas is mainly Jeffrey pine with an understory of big sagebrush, antelope bitterbrush, and mountainmahogany. In some areas mountainmahogany dominates the plant community. This soil is suited to Jeffrey pine. If planted to Jeffrey pine, it can produce about 2,200 cubic feet, or 8,800 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

In all the soils, the steepness of slope limits the kind of equipment that can be used in forest management. Management that minimizes the risk of erosion is essential.

The main limitations to use of this unit as sites for roads are steepness of slope of all these soils and the low strength and high clay content of the Hirschdale soil. Suitable base material and an adequate wearing surface are needed. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

The soils in this unit are in capability subclass VIIs, nonirrigated.

1440—Tallac very bouldery sandy loam, 4 to 30 percent slopes. This deep, well drained soil is on glacial moraines. It formed in glacial deposits derived from mixed rock sources. Elevation is 7,500 to 8,600 feet. The average annual precipitation is 35 to 40 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 30 to 50 days.

Typically, 5 to 15 percent of the surface is covered with boulders. The surface layer is brown very bouldery sandy loam about 26 inches thick. The upper part of the substratum, to a depth of 45 inches, is light yellowish brown very stony sandy loam. The lower part of the substratum is weakly silica-cemented very bouldery loamy sand. Depth to the silica cementation ranges from 40 to 60 inches.

Included in this map unit are Macareeno soils, which support quaking aspen and are near seeps and along streams; Burnborough soils on colluvial slopes; Carioca soils on higher plateau remnants; and wet areas in drainageways. The unit is about 5 percent Macareeno soils, 3 percent Burnborough soils, 4 percent Carioca soils, and 3 percent wet areas.

Permeability of this Tallac soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used as woodland.

The present vegetation in most areas is mainly California red fir, white fir, and Jeffrey pine with an understory of pinemat manzanita, big sagebrush, and snowbrush ceanothus. This soil is suited to California red fir. If planted to California red fir, it can produce about 10,550 cubic feet, or 65,700 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The main limitations to the use of this soil as sites for the construction of roads are steepness of slope and stoniness. Roads should be provided with an adequate wearing surface and, if possible, should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

This soil is in capability subclass VIIs, nonirrigated.

1441—Tallac stony sandy loam, 30 to 50 percent slopes. This deep, well drained soil is on glacial moraines. It formed in glacial deposits derived from mixed rock. Elevation is 7,500 to 9,000 feet. The average annual precipitation is 35 to 40 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 30 to 50 days.

Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is brown stony sandy loam about 26 inches thick. The upper part of the substratum, to a depth of 45 inches, is light yellowish brown very stony sandy loam. The lower part of the substratum is weakly silica-cemented very bouldery loamy sand. Depth to silica cementation ranges from 40 to 60 inches.

Included in this map unit are Macareeno soils, which support quaking aspen and are near seeps and along streams; Sibelia soils below ridges and peaks; Meiss soils on ridges; and Rock outcrop on crests and peaks. The unit is about 5 percent Macareeno soils, 4 percent Sibelia soils, 4 percent Meiss soils, and 2 percent Rock outcrop.

Permeability of this Tallac soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as woodland.

The present vegetation in most areas is mainly California red fir, white fir, and Jeffrey pine with an understory of pinemat manzanita, big sagebrush, and snowbrush ceanothus. This soil is suited to California red fir. If planted to California red fir, it can produce about 10,550 cubic feet, or 65,700 board feet (Scribner rule), of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old.

The steepness of slope limits the kind of equipment that can be used in forest management. Management that minimizes the risk of erosion is essential.

The main limitation to use of this unit as sites for roads is steepness of slope. If possible, roads should be located in less sloping areas to minimize cutting and filling and to reduce erosion.

This soil is in capability subclass VIIs, nonirrigated.

1450—Meiss-Sibelia-Rock outcrop association. This map unit is on mountainous uplands. Elevation is 8,000 to 10,000 feet. The average annual precipitation is 35 to 50 inches, the average air temperature is 39 to 41 degrees F, and the average frost-free period is 30 to 50 days.

This unit is 40 percent Meiss very cobbly sandy loam, 15 to 50 percent slopes; 30 percent Sibelia very stony sandy loam, 15 to 50 percent slopes; and 15 percent Rock outcrop. The Meiss soil is near peaks and ridges. The Sibelia soil is on high colluvial slopes.

Included in this unit are Macareeno soils, which support quaking aspen and occur near seeps and streams; Fugawee soils, which occur on lower slopes; and Tallac soils, which occur on remnants of glacial moraines. The unit is about 5 percent Macareeno soils, 5 percent Fugawee soils, and 5 percent Tallac soils. The percentage varies from one area to another.

The Meiss soil is shallow and excessively drained. It formed in residuum dominantly of andesitic breccia. Typically, 35 to 50 percent of the surface is covered with cobbles. The surface layer is brown very cobbly sandy loam about 7 inches thick. The underlying material is yellowish brown gravelly loam about 13 inches thick over bedrock. Depth to bedrock ranges from 10 to 20 inches.

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

The Sibelia soil is deep and well drained. It formed in colluvium and residuum from mixed rock, but dominantly andesite and basalt. Typically, 3 to 15 percent of the surface is covered with stones. The surface layer is grayish brown very stony sandy loam about 6 inches thick. The subsoil is pale brown very gravelly sandy loam about 14 inches thick. The substratum is pale brown very cobbly sandy loam about 27 inches thick over highly weathered bedrock. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Sibelia soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.