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Forest Service

In Cooperation with
U.S. Department
of Agriculture -
Soil Conservation
Service and the
Regents of the
University of
California
(Agricultural
Experiment Station)

Soil Survey of Sierra National Forest Area, California

How To Use This Soil Survey

General Soil Map

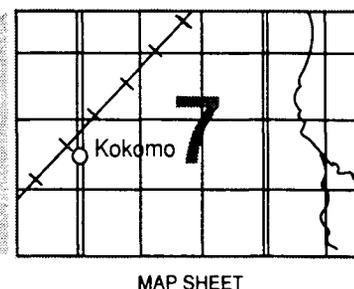
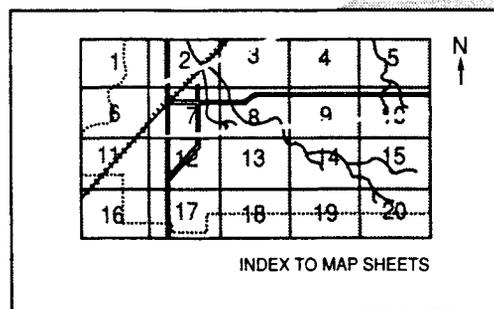
The general soil map, which is the small scale map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

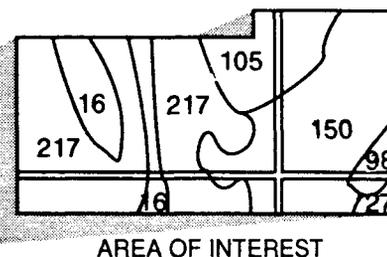
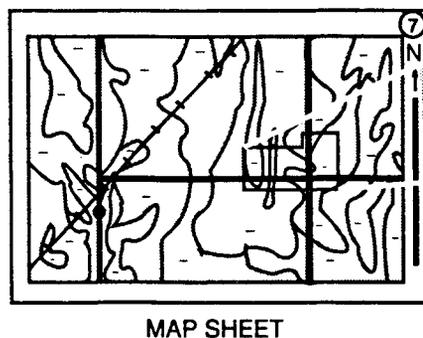
Detailed Soil Maps

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

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



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



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

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

Sierra National Forest Area, California

This is a publication of the United States Department of Agriculture, Forest Service, Pacific Southwest Region and is a joint effort and the University of California (Agricultural Experiment Station) and the Soil Conservation Service. As a part of the National Cooperative Soil Survey, the fieldwork and technical quality control for this survey were the responsibility of the Forest Service. The correlation of the soils was done by the Soil Conservation Service in consultation with the Forest Service. 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, handicap, or age.

Major fieldwork for this soil survey was performed in the periods from 1955 to 1959 and 1974 to 1982. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This survey was made cooperatively by the Forest Service and the Soil Conservation Service. The soil survey area consists of the Sierra National Forest.

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.

Cover: This is a view of Eagle's Beak Rock on the Minarets Ranger District. Below the rock is map unit 153 - Rock outcrop-Lithic Xeropsamments complex, 45 to 85 percent slopes and in the lower left corner is map unit 114 - Cagwin family-Lithic Xeropsamments-Rock outcrop complex, 45 to 65 percent slopes.

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Foreword

The Soil Survey of Sierra National Forest Area, California, in parts of Fresno, Madera, and Mariposa Counties, was designed to facilitate broad Forest-wide resource management planning and to increase the knowledge of our environment. It contains predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil.

This soil survey has been prepared primarily for Forest Resource Planners and Managers. It is useful for preliminary project planning, for identifying general soil management considerations, and for evaluation of more intensive soil survey needs. The survey should be used for detailed resource management planning and project level planning and design only after field verification.

Great differences in soil properties can occur even within short distances. Soil may be shallow to bedrock and incapable of producing commercial timber. They may be seasonally wet or subject to flooding. A low available water capacity makes a soil poorly suited to reforestation. A high water table makes a soil suitable for use as summer range.

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 map unit is shown on detailed soil maps. Each kind of soil in the survey area is described, and information is given about each soil for specific uses.

This soil survey can be useful in the conservation, improvement, and productive use of soil, water, and other resources.



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Location of the Sierra National Forest Area, California

Soil Survey of Sierra National Forest Area, California

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Fieldwork by Jack R. Fisher, Ben A. Nakamura, Frank B. Estril, and David R. Giger, Forest Service; and Gordon L. Huntington, University of California

General Nature of the Survey Area

The survey area is located on the western slope of the Central Sierra Nevada about 25 miles northeast of the City of Fresno. The area covers about 996,000 acres. It is bordered on the north by the Yosemite National Park and Stanislaus National Forest, on the west by the east side foothills of the San Joaquin Valley, on the south by the Sequoia National Forest, and on the east by the crest of the Sierra Nevada.

History and Development

Tribes of Mono Indians lived in the area before settlers, explorers, and loggers arrived. Between 1880 and 1930, railroad logging was an important industry in the survey area. The Sierra National Forest was established by Congress in 1908. Several years later the area became well known for having built one of the world's first large hydroelectric power projects. Today, the survey area is still important for its timber production, hydroelectric power output, and recreational use.

Vegetation

From 1,000 to 3,200 feet the elevation foothills and mountainsides are covered by annual grasses, blue oak, live oak, or manzanita. At about 3,200 to 6,400 feet elevation a mixed conifer forest of ponderosa pine, sugar pine, white fir, and incense cedar cover the mountainsides. White fir, red fir, and Jeffrey pine dominate mountainsides and glacial moraines from 6,400 to 8,200 feet. Above 8,200 feet red fir, lodgepole pine, and western white pine are scattered over rocky mountainsides and bouldery glacial moraines.

The Soil-Vegetation-Geology Profile following the glossary shows a cross-section of the survey area from the town of North Fork east to Mt. Givens. It illustrates in a generalized way the relationship between several soils with vegetation, elevation and parent material. The par-

ent material is phases of granite, alluvium, and glacial deposits. Granite was chosen for this transect since the majority of the survey area is made up of this geologic type. One can quickly see where these soils are on the landscape in relation to the vegetation series, the elevation zone, and the parent material they are on. It is also important to note where they occur in relation to each other.

Geomorphology

The survey area is part of the uplifted westward-tilted Sierra Nevada block that has been deeply incised by the Merced, San Joaquin, and Kings Rivers and their tributaries, and subsequently modified by glacial action above 6,000 feet elevation. Elevations range from 1,000 feet in the foothills to 10,800 feet on glaciated ridges.

The survey area is made up of granitic, metamorphic, and volcanic rock types (1). Granitic rocks form the main body of the survey area. Remnants of metamorphic rocks are visible in the southwest and northwest parts of the survey area. In other parts the granite is overlain by volcanic remnants or material deposited by glaciers. Most of the glacial material is above 6,000 feet elevation from north of Huntington Lake to Wishon Reservoir.

Climate

The survey area has a Mediterranean climate with cool, moist winters and warm, dry summers. Mean annual precipitation ranges from 20 to 60 inches with most of this falling as snow above about 5,000 feet elevation. Most of the precipitation falls from November through April with isolated thunderstorms occurring in the summer months. Mean temperatures range from 20° to 45° F. in the winter months to 55° to 75° F. in the summer months. Temperatures tend to decrease with increasing elevation.

How This Survey Was Made

This Order 3 soil survey has followed the directives and guidelines in the Forest Service Manual and Handbooks (3). It has also followed the concepts, procedures, and guidelines of the National Cooperative Soil Survey as specified in the Soil Survey Manual (7), the National Soils Handbook (6), and the soil classification system as stated in Soil Taxonomy (8, 9).

Soil scientists began the inventory by collecting, studying, and correlating soil genesis and morphology data, including lithological, geomorphological, topographical, climatic, and vegetative data, for the survey area and for adjoining areas.

The data and information were assimilated and transferred to a single base map of suitable scale and accuracy, forming the beginning soil map unit delineations, or a schematic map. With the schematic map and aerial photo field sheets (stereo-pair coverage) in hand, a reconnaissance study of the survey area was made. The delineations on the schematic map were checked for accuracy of content and location. The aerial photos were studied stereoscopically and the photo images were compared to the conditions found on the ground to ensure that later recognition by photo interpretation would be credible. Lithologic, geomorphic, soil, and vegetative characteristics were recorded in field notes, on the schematic map, and on the aerial photo field sheets.

Using the augmented and corrected schematic map, field notes, and an understanding of how the photo images relate to actual conditions on the ground, the soil scientists delineated map units on the aerial photographs. The map units correspond to segments of the landscape having similar landform, vegetative cover, and soils as determined by a knowledge of ground conditions and by stereoscopic aerial photo interpretation. The aerial photos with the delineated map units and delineation symbols became the exploratory or preliminary soil map.

With the aerial photographs (exploratory soil maps) and a field stereoscope, the soil scientists examined on the ground as many delineations of each map unit as possible, considering limited access in places and the time allowed to complete the survey. Map units were examined, studied, and described by aerial photo interpretations and on-the-ground investigation.

Because the survey is Order 3 in intensity (3), and because of the time allotted for its completion, not every delineation of each map unit was visited and examined on the ground. Few of the delineations with no easy access were visited, but they were scrutinized by aerial photo interpretation. Possibly one-third to one-half of the delineations on the field sheets and maps were not examined on the ground. Consequently, the data in this report are not suitable for project planning without field verification.

At each site that was visited and examined, the individual soils were studied, named, described, and classified, and enough data were collected to make interpretations and predictions concerning the use and management of each soil. However, the exact location of each soil was not delineated. The map units in most places consist of a group of soils on a particular landscape that has been delineated on the aerial photo field sheets. Depending on the location and extent of the individual soils that are components of the delineated map unit, a map unit is called an association or a complex. The soil scientists made a field study and aerial photo examination to estimate the percentage of each soil component in each map unit. The map units do not necessarily consist of similar soils. They consist of geographically associated soils that may be, and in places are, quite different in their characteristics and their suitability for use and management. For this reason also, the data in this report are not suitable for project planning without field verification.

The interpretations and predictions concerning use and management in this report are based on the soil scientists' knowledge and understanding of the conditions recognized and measured in the field. In classifying the soils, soil scientists can also, with acceptable reliability, bring information concerning use and management of a particular soil from other survey areas where the same soil occurs and has been recognized and studied. Some use and management interpretations and predictions should be considered as first or second approximations owing to the relative few examinations and measurements that were made. This is still another reason that limits the data in this survey for project planning without field verification.

Despite the cautions that have been given concerning the use of data in this survey for project planning, the survey is adequate and reliable for its intended and designed purpose: a base for a forestwide system of land management planning.

General Soil Map Units

The General Soil Map provides a broad perspective of the soils in the survey area. The map is made up of units that are broad groupings of the detailed soil map units in this report. Each unit consists of two or three major soils and/or Rock outcrop, and several minor components as inclusions. Each has a unique association of soil, vegetative, and geologic features.

This map is useful for comparing large areas for general kinds of land use. Areas that are generally suitable for certain kinds of land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of the generalization of soil map units and the small scale, the map does not show the kind of soil at a specific site. Thus, it is unsuitable for planning the management of an area or for selecting a site for specific uses. The map is well suited for State or Regional planning purposes.

Map Unit Description

Soils of the Thermic Soil Temperature Regime

Two map units are in this group. They make up about 11 percent of the survey area.

1. Auberry-Ahwahnee families

Moderately deep or deep, well drained soils; on foothills, mountainsides, and ridges.

This map unit is on foothills, mountainsides, and ridges. Slope is 5 to 75 percent. Elevation ranges from 1,000 to 3,800 feet and the average annual precipitation ranges from 20 to 35 inches.

The major plant series in this unit are interior live oak, blue oak, wedgeleaf ceanothus, annual grass-forb, mariposa manzanita, and canyon live oak.

This unit makes up 6 percent of the survey area. It is about 45 percent Auberry family soils and 40 percent Ahwahnee family soils. The remaining 15 percent consists of minor components, including: Rock outcrop, Tollhouse family soils, and soils similar to the Auberry and Ahwahnee families except they are darker or are less than 20 inches deep.

The Auberry and Ahwahnee family soils are moderately deep to deep, well drained, and formed from granitic

rock. The surface layer of these soils is coarse sandy loam. The Auberry family soil has a sandy clay loam subsoil and the Ahwahnee family soil has a coarse sandy loam subsoil.

This unit is used mainly for winter and spring livestock grazing and as deer winter range.

2. Coarsegold-Auberry families-Typic Argixerolls

Moderately deep or deep, well drained soils formed on metasedimentary, basic igneous, or acid igneous rock; on foothills, mountainsides, and ridges.

This map unit is on foothills, mountainsides, and ridges. Slope is 15 to 85 percent. Elevation ranges from 1,000 to 4,500 feet and the average annual precipitation ranges from 20 to 35 inches.

The major plant series in this unit are blue oak, annual grass-forb, and interior live oak.

This unit makes up 5 percent of the survey area. It is about 45 percent Coarsegold family soils, 25 percent Auberry family soils, and 15 percent Typic Argixerolls. Typic Argixerolls are on 15 to 50 percent slopes. The remaining 15 percent consists of minor components, including: Rock outcrop, Delpiedra family soils, and soils similar to the Coarsegold family.

The Coarsegold family soils are moderately deep to deep, well drained and formed from metasedimentary rock. Typically, the surface layer is loam and the subsoil is gravelly clay loam.

The Auberry family soils are moderately deep to deep, well drained, and formed from granitic rock. Typically, the surface layer is coarse sandy loam and the subsoil is sandy clay loam.

Typic Argixerolls are moderately deep to deep, well drained or moderately well drained, and formed from basic igneous or metasedimentary rock. Typically, the surface layer is sandy loam and the subsoil is gravelly sandy clay loam or clay loam.

This unit is used mainly for winter and spring livestock grazing and as deer winter range.

Soils of the Mesic Soil Temperature Regime

Six map units are in this group. They make up about 42 percent of the survey area.

3. Tollhouse family-Rock outcrop-Chawanakee family

Shallow, somewhat excessively drained soils, and Rock outcrop; on mountainsides and ridges.

This map unit is on mountainsides and ridges. Slope is 30 to 85 percent. Elevation ranges from 2,000 to 6,400 feet and the average annual precipitation ranges from 25 to 45 inches.

The major plant series in this unit are interior live oak, canyon live oak, wedgeleaf ceanothus, and mariposa manzanita.

This unit makes up 6 percent of the survey area. It is about 45 percent Tollhouse family soils, 25 percent Rock outcrop, and 20 percent Chawanakee family soils. The remaining 10 percent consists of minor components, including: Auberry and Ahwahnee family soils.

The Tollhouse and Chawanakee family soils are shallow, somewhat excessively drained, and formed from granitic rock. Typically, these soils are coarse sandy loam throughout.

Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock.

This unit is used mainly for spring and summer livestock grazing and as deer winter range.

4. Dystric Lithic Xerochrepts-Ultic Haploxeralfs

Shallow or moderately deep, somewhat excessively drained or well drained soils formed from metasedimentary rock; on mountainsides and ridges.

This map unit is on mountainsides and ridges. Slope is 15 to 85 percent. Elevation ranges from 1,500 to 6,400 feet and the average annual precipitation ranges from 35 to 50 inches. Below about 3,000 feet elevation, particularly on south and west aspects the soils in this map unit are in the thermic soil temperature regime.

The major plant series in this unit are mariposa manzanita, canyon live oak, annual grass-forb, mariposa manzanita/knobcone pine, and mariposa manzanita/ponderosa pine.

This unit makes up 5 percent of the survey area. It is about 45 percent Dystric Lithic Xerochrepts and 40 percent Ultic Haploxeralfs. The remaining 15 percent consists of minor components, including: Rock outcrop and the Neuns family soils.

These soils have formed from metasedimentary rock. Dystric Lithic Xerochrepts are shallow and somewhat excessively drained. Typically, the surface layer is gravelly loam and the subsoil is very cobbly loam. Ultic Haploxeralfs are moderately deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is silt loam or gravelly loam.

This unit is used mainly for spring and summer livestock grazing, deer winter range, dispersed recreation, and limited timber production.

5. Chaix-Chawanakee families-Rock outcrop

Shallow or moderately deep, somewhat excessively drained or well drained soils, and Rock outcrop; on mountainsides and ridges.

This map unit is on mountainsides and ridges. Slope is 5 to 65 percent. Elevation ranges from 3,000 to 6,700 feet and the average annual precipitation ranges from 30 to 50 inches.

The major plant series in this unit are ponderosa pine, mixed conifer-pine, canyon live oak, mariposa manzanita, and black oak/ponderosa pine. The forest survey site class is 4 to 7 and NC.

This unit makes up 5 percent of the survey area. It is about 40 percent Chaix family soils, 30 percent Chawanakee family soils, and 15 percent Rock outcrop. The remaining 15 percent consists of minor components, including: Chaix family, deep and Holland family soils.

These soils formed from granitic rock. Chaix family soils are moderately deep and somewhat excessively drained or well drained. Chawanakee family soils are shallow and somewhat excessively drained. Both soils are coarse sandy loam.

Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock.

This unit is used mainly for timber production and for spring and summer livestock grazing.

6. Shaver-Chaix, deep families

Deep, well drained soils; on mountainsides and ridges.

This map unit is on mountainsides and ridges. Slope is 5 to 65 percent. Elevation ranges from 3,000 to 6,400 feet and the average annual precipitation ranges from 30 to 50 inches.

The major plant series in this unit are mixed conifer-fir, mixed conifer-pine, big tree, and ponderosa pine. The forest survey site class is 2 to 4.

This unit makes up 6 percent of the survey area. It is about 45 percent Shaver family soils and 40 percent Chaix family, deep soils. The remaining 15 percent consists of minor components, including: Chaix family and Cannell family soils. Most of the Shaver family soils are in the Fresno County portion of the survey area and Chaix family, deep soils are in the Madera County portion.

The Shaver family and Chaix family, deep soils are deep, well drained, and formed from granitic rock. Both soils are coarse sandy loam in the surface layer and the subsoil. The Shaver family soils have a much darker and thicker surface layer than the Chaix family, deep soils.

This unit is used mainly for timber production.

7. Holland-Chaix families

Deep or moderately deep, well drained or somewhat excessively drained; on mountainsides and ridges.

This map unit is on mountainsides and ridges. Slope is 5 to 65 percent. Elevation ranges from 2,700 to 6,000 feet and the average annual precipitation ranges from 25 to 55 inches.

The major plant series in this unit are mixed conifer-pine, ponderosa pine, and mariposa manzanita/ponderosa pine. The forest survey site class is 3 to 5.

This unit makes up 17 percent of the survey area. It is about 70 percent Holland family soils and 15 percent Chaix family soils. The remaining 15 percent consists of minor components, including: Chaix family, deep soils, Chawanakee family soils, Tollhouse family soils, and Rock outcrop.

These soils are formed from granitic rock. Holland family soils are deep and well drained. Typically, the surface layer is sandy loam and the subsoil is sandy clay loam. Chaix family soils are moderately deep and

somewhat excessively drained or well drained. It is coarse sandy loam throughout.

This unit is used mainly for timber production.

8. Neuns-Holland families-Ultic Haploxeralfs, deep

Deep or moderately deep, well drained soils formed from metamorphic or basalt rock; on mountainsides, colluvial slopes, and ridges.

This map unit is on mountainsides, colluvial slopes, and ridges. Slope is 15 to 60 percent. Elevation ranges from 3,000 to 8,200 feet and the average annual precipitation ranges from 35 to 50 inches. Above about 6,400 feet elevation Ultic Haploxeralfs, deep soils are in the frigid soil temperature regime.

The major plant series in this unit are ponderosa pine, mixed conifer-fir, mixed conifer-pine, mariposa manzanita/ponderosa pine, and Jeffrey pine. The forest survey site class is 3 to 5.

This unit makes up 3 percent of the survey area. It is about 40 percent Neuns family soils, 30 percent Holland family soils and 15 percent Ultic Haploxeralfs, deep. Ultic Haploxeralfs, deep are mainly in the Buffin Meadow and Brown Cone areas. The remaining 15 percent consists of minor components, including: Ultic Haploxeralfs and soils similar to the Neuns and Holland families.

The Neuns and Holland family soils formed on metamorphic rock. Neuns family soils are moderately deep to deep and well drained. Typically, the surface layer is gravelly loam and the subsoil is very cobbly loam.

Holland family soils are deep and well drained. Typically, the surface layer is sandy loam and the subsoil is sandy clay loam.

Ultic Haploxeralfs, deep soils are deep, well drained, and formed from basalt or andesite. Typically, the surface layer is cobbly sandy loam and the subsoil is very stony loam or clay loam.

This unit is used mainly for timber production.

Soils of the Frigid Soil Temperature Regime

Four map units are in this group. They make up about 35 percent of the survey area.

9. Gerle-Ledford families-Typic Xerumbrepts

Moderately deep or deep, somewhat excessively drained or well drained soils; on mountainsides, ridges, and volcanic flows.

This map unit is on mountainsides, ridges, and volcanic flows. Slope is 5 to 55 percent. Elevation ranges from 6,000 to 8,800 feet and the average annual precipitation ranges from 30 to 60 inches.

The major plant series in this unit are red fir, Jeffrey pine, and mixed conifer-fir. The forest survey site class is predominantly 3 and 4.

This unit makes up 5 percent of the survey area. It is about 30 percent Gerle family soils, 25 percent Ledford family soils and 20 percent Xerumbrepts. Much of the Gerle family soils are in the McKinley Grove area, Ledford family soils are in the Globe Rock area, and Typic Xerumbrepts are in the Clover Meadow and Little Rancheria Creek areas. The remaining 25 percent consists of minor components, including: Cagwin family soils, Entic Xerumbrepts, Rock outcrop, Dystric Xerochrepts, Ultic Haploxeralfs, deep, Cannell family soils, and Aquic Dystric Xerochrepts.

Gerle and Ledford family soils are formed from granitic rock. The Gerle family soils are moderately deep to deep and well drained. Typically, it is gravelly or cobbly coarse sandy loam. Ledford family soils are deep and somewhat excessively drained. The surface layer is sandy loam and the substratum is gravelly coarse sandy loam or loamy sand.

Typic Xerumbrepts are deep, well drained, and formed mainly from basalt. Typically, the surface layer is loam, the subsoil is gravelly sandy loam, and the substratum is extremely gravelly loamy sand.

This unit is used mainly for timber production and summer grazing.

10. Cagwin family-Lithic Xeropsamments-Rock outcrop

Moderately deep or shallow, somewhat excessively drained or excessively drained soils; on mountainsides and ridges.

This map unit is on mountainsides and ridges. Slope is 2 to 65 percent. Elevation ranges from 5,600 to 8,500 feet and the average annual precipitation ranges from 25 to 60 inches.

The major plant series in this unit are red fir, Jeffrey pine, greenleaf manzanita/Jeffrey pine, and mixed conifer-fir. The forest survey site class is 3 to 7.

This unit makes up 13 percent of the survey area. It is about 45 percent Cagwin family soils, 20 percent Lithic Xeropsamments, and 20 percent Rock outcrop. The remaining 15 percent consists of minor components, including: Cannell family soils and Sirretta family soils.

Cagwin family soils and Lithic Xeropsamments formed from granitic rock. They are both loamy sand. Cagwin family soils are moderately deep and somewhat excessively drained. Lithic Xeropsamments are shallow and excessively drained.

Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock.

This unit is used mainly for timber production and limited summer grazing.

11. Sirretta-Umpa-Umpa, deep families

Deep or very deep, moderately well drained, well drained, somewhat excessively drained, or excessively drained soils; on moraines, mountainsides, and colluvial slopes.

This map unit is on moraines, mountainsides, and colluvial slopes. Slope is 3 to 65 percent. Elevation ranges from 6,000 to 8,600 feet and the average annual precipitation ranges from 25 to 60 inches.

The major plant series in this unit are Jeffrey pine, mixed conifer-fir, and red fir. The forest survey site class is 3 to 5.

This unit makes up 10 percent of the survey area. It is about 50 percent Sirretta family soils, 20 percent Umpa family soils, and 15 percent Umpa family, deep soils. The Umpa family, deep soils are mainly in the White Chief Mtn. area. The remaining 15 percent consists of minor components, including: Rock outcrop, Cagwin family soils, Aquic Dystric Xerochrepts, and Umpa family, wet soils. The forest survey site class is 3 to 5.

The Sirretta family soils are deep and somewhat excessively drained or excessively drained, and formed in glacial till from granitic rock. Typically, the surface layer is gravelly coarse sandy loam and the substratum is very cobbly loamy coarse sand.

The Umpa family soils are deep, well drained or moderately well drained, and formed in glacial till from granitic and metamorphic rock. Typically, the surface layer is

bouldery sandy loam and the subsoil is very stony coarse sandy loam.

The Umpa family, deep soils are deep, well drained, and formed in material from metasedimentary, granitic or metavolcanic rock. Typically, the surface layer is cobbly sandy loam and the subsoil is very cobbly loam.

This unit is used mainly for timber production.

12. Rock outcrop-Lithic Xeropsamments

Rock outcrop, and shallow excessively drained soils; on mountainsides and ridges.

This map unit is on mountainsides and ridges. Slope is 15 to 85 percent. Elevation ranges from 5,200 to 8,400 feet and the average annual precipitation ranges from 25 to 50 inches. Below about 5,600 feet elevation the soil in this map unit is in the mesic soil temperature regime.

The major plant series in this unit is greenleaf manzanita/Jeffrey pine.

This unit makes up 7 percent of the survey area. It is about 60 percent Rock outcrop and 25 percent Lithic Xeropsamments. The remaining 15 percent consists of minor components, including: Sirretta family soils, Cagwin family soils, and soils similar to Lithic Xeropsamments except they have more than 35 percent rock fragments.

Rock outcrop consists of massive exposures of regionally jointed and fractured granitic rock.

Lithic Xeropsamments are in pockets, in fractures, and covering the rock. They are shallow, excessively drained, and loamy coarse sand.

This unit is used mainly for dispersed and developed recreation.

Soils of the Cryic Soil Temperature Regime

Two map units are in this group. They make up about 12 percent of the survey area.

13. Stecum family-Rock outcrop

Deep, excessively drained soils, and Rock outcrop, including glacial erratics; on moraines, outwash plains, mountainsides, and colluvial slopes.

This map unit is on moraines, outwash plains, mountainsides, and colluvial slopes. Slope is 3 to 65 percent. Elevation ranges from 8,000 to 10,600 feet and the average annual precipitation ranges from 25 to 60 inches.

The major plant series in this unit are lodgepole pine, red fir, and western white pine.

This unit makes up 7 percent of the survey area. It is about 65 percent Stecum family soils and 20 percent Rock outcrop. The remaining 15 percent consists of minor components, including: Aquic Cryumbrepts, Entic Cryumbrepts, Cryorthents, and Rubble land.

Stecum family soils are deep, excessively drained, and formed in glacial till from granitic rock. Typically, the surface layer is cobbly coarse sandy loam and the subsoil is very cobbly loamy coarse sand.

Rock outcrop consists of isolated outcroppings, massive exposures, and large glacial erratic boulders.

14. Rock outcrop-Entic Cryumbrepts

Rock outcrop, and moderately deep, somewhat excessively drained or excessively drained soils; on mountainsides and ridges.

This map unit is on mountainsides and ridges. Slope is 5 to 60 percent. Elevation ranges from 8,300 to 10,600 feet and the average annual precipitation ranges from 35 to 60 inches.

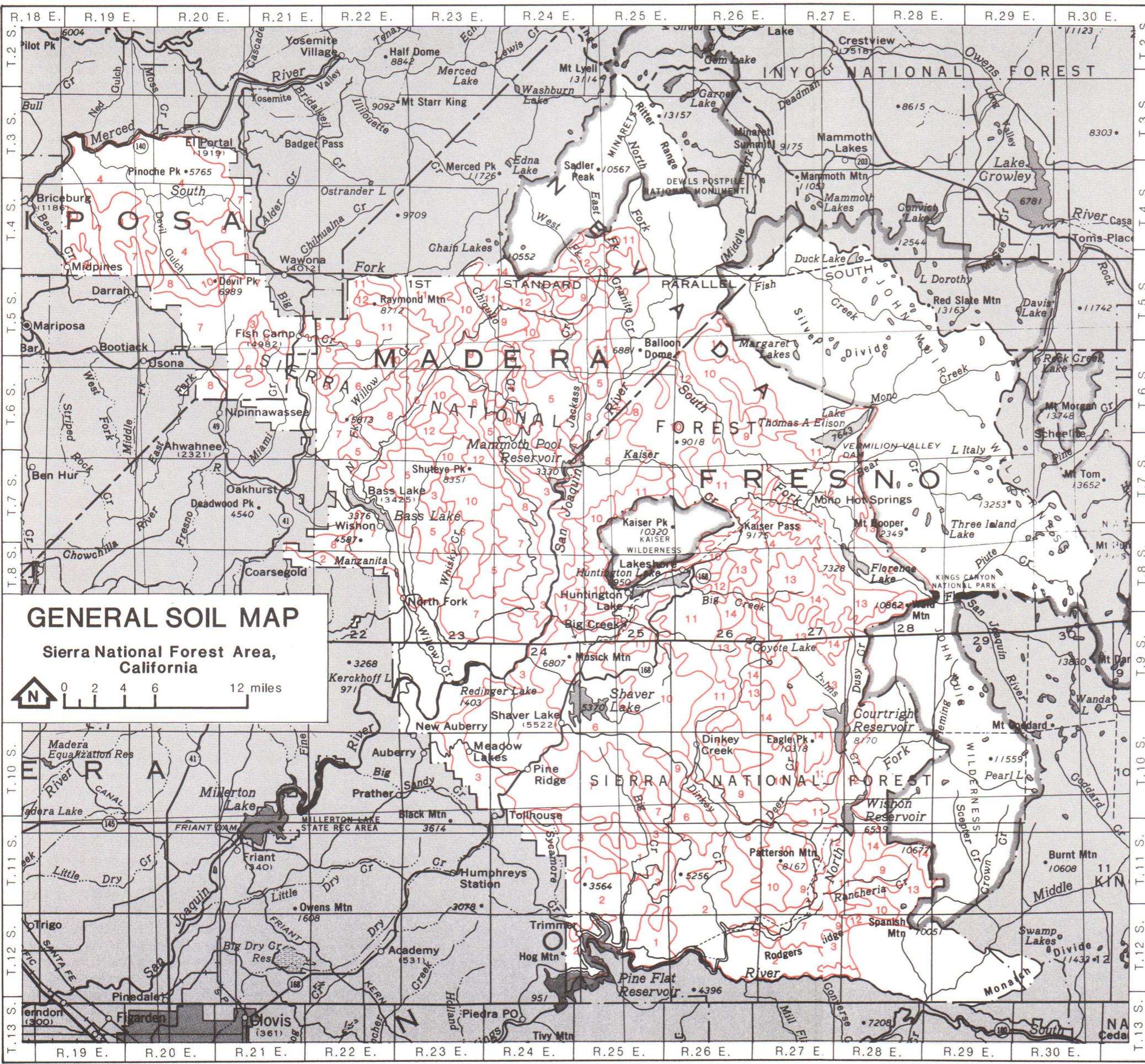
The major plant series in this unit are lodgepole pine and western white pine.

This unit makes up 5 percent of the survey area. It is about 50 percent Rock outcrop and 35 percent Entic Cryumbrepts. The remaining 15 percent consists of minor components, including: Stecum family soils, Cryorthents, and Rubble land.

Rock outcrop consists of massive exposures of regionally jointed and fractured granitic rock.

Entic Cryumbrepts are moderately deep, somewhat excessively drained or excessively drained, and formed from granitic rock. It is gravelly coarse sandy loam to very stony loamy coarse sand.

This unit is used mainly for dispersed recreation.



MAP UNITS

SOILS OF THE THERMIC SOIL TEMPERATURE REGIME

1. Auberry — Ahwahnee families: Moderately deep or deep, well drained soils; on foothills, mountainsides, and ridges.
2. Coarsegold — Auberry families — Typic Argixerolls: Moderately deep or deep, well drained soils formed on metasedimentary, basic igneous, or acid igneous rock; on foothills, mountainsides, and ridges.

SOILS OF THE MESIC SOIL TEMPERATURE REGIME

3. Tollhouse family — Rock outcrop — Chawanakee family: Shallow, somewhat excessively drained soils, and Rock outcrop; on mountainsides and ridges.
4. Dystric Lithic Xerochrepts — Ultic Haploxeralfs: Shallow or moderately deep, somewhat excessively drained or well drained soils formed on metasedimentary rock; on mountainsides and ridges.
5. Chaix — Chawanakee families — Rock outcrop: Shallow or moderately deep, somewhat excessively drained or well drained soils, and Rock outcrop; on mountainsides and ridges.
6. Shaver — Chaix, deep families: Deep, well drained soils; on mountainsides and ridges.
7. Holland — Chaix families: Deep or moderately deep, well drained or somewhat excessively drained; on mountainsides and ridges.
8. Neuns — Holland families — Ultic Haploxeralfs, deep: Deep or moderately deep, well drained soils formed on metamorphic or basalt rock; on mountainsides, colluvial slopes, ridges.

SOILS OF THE FRIGID SOIL TEMPERATURE REGIME

9. Gerle — Ledford families — Typic Xerumbrepts: Moderately deep or deep, somewhat excessively drained or well drained soils; on mountainsides, ridges, and volcanic flows.
10. Cagwin family — Lithic Xeropsamments — Rock outcrop: Moderately deep or shallow, somewhat excessively drained or excessively drained soils; on mountainsides and ridges.
11. Sirretta — Umpa — Umpa, deep families: Deep or very deep, moderately well drained, well drained, somewhat excessively drained or excessively drained soils; on glacial moraines, mountainsides, and colluvial slopes.
12. Rock outcrop — Lithic Xeropsamments: Rock outcrop, and shallow excessively drained soils; on mountainsides and ridges.

SOILS OF THE CRYIC SOIL TEMPERATURE REGIME

13. Stecum family — Rock outcrop: Deep, excessively drained soils, and Rock outcrop, including glacial erratic boulders; on glacial moraines, outwash plains, mountainsides, and colluvial slopes.
14. Rock outcrop — Entic Cryumbrepts: Rock outcrop, and moderately deep, somewhat excessively drained or excessively drained soils; on mountainsides and ridges.

Detailed Soil Map Units

The map unit symbols on the soils maps are described in this section. The map unit descriptions, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They can also be used to plan the management needed for those areas.

Each map unit on the soil maps represents an area on the landscape and consists of one or more soils for which the unit is named. The symbol from the soil map precedes the map unit name. 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 similar make up a soil family, such as Ahwahnee family soil. Except for differences in texture of the surface layer or of the underlying material, all soils of a family have major horizons that are similar in composition, thickness, and arrangement.

Other soils, such as Aquic Cryumbrepts, have many more differences than soil families. These soils, however, have some similar properties which group them together so that their use can be predicted. These soils were grouped more broadly than soil families because they were either highly variable, did not take up much area, or there was too little information known about them. Therefore, the interpretations given for these soils should be taken in a broader sense than soil families.

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 described in the map units.

Many map units are made up of two or three soils and/or miscellaneous areas. These map units are called complexes or associations.

A complex consists of two or more soils and/or miscellaneous areas 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. Chaix-Chawanakee families-Rock outcrop complex, 35 to 65 percent slopes is an example.

An association is made up of two or more geographically associated soils and/or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion

of the soils are somewhat similar. Tollhouse family-Rock outcrop association, 60 to 85 percent slopes is an example. Each map unit includes small scattered areas of soils and miscellaneous areas other than those for which the map unit is named. Some of these soils and miscellaneous areas differ substantially from the major soils and miscellaneous areas. Such differences could significantly affect use and management in the map unit. The included soils and miscellaneous areas are identified in each map unit description.

Definitions and Criteria

Map Units. The map unit symbol corresponds to the same symbol in the delineations on the maps in the back of the report. The map unit name then follows and it includes the name of the soils and miscellaneous area in the map unit, and the slope range of the unit.

Elevation	Annual Precipitation
The range of elevation (in feet) for the map unit.	A range of average annual precipitation (in inches) for the map unit.

Map Unit Components. The name of the dominant soils and miscellaneous area which make up the map unit. Each soil component is described separately under Taxonomic Unit Descriptions.

Approximate Proportion. The approximate proportion of the component in the map unit.

Landscape Position. The name of the landforms on which the component occurs.

Slope. The range of slope for the component.

Typical Vegetation Series. The plant series typically growing on the soil component. The series conform as close as possible to the series defined in CALVEG, Regional Ecology Group, 1981 (2). They are:

Big Tree Series - This series consists of groves of giant sequoia trees (*Sequoiadendron giganteum*) within Mixed Conifer stands between 4,000 and 6,000 feet.

Mixed Conifer-Fir Series - This series consists of a number of conifer species including white fir (*Abies concolor*) and sugar pine (*Pinus lambertiana*) and ponderosa pine (*P. ponderosa*). Douglas fir (*Pseudotsuga menziesii*), and incense-cedar (*Libocedrus decurrens*) occur as occasional associates. These mixed conifers occur within an

elevation range of 3,000 feet to 8,600 feet. At lower elevations, black oak (*Quercus kelloggii*) may be an important associate. Stand structure and local dominance is highly variable; any one species may be dominant in a small area, but overall dominance is generally shared by white fir and at least one other species.

Jeffrey Pine Series - Above the Ponderosa Pine Series is the Jeffrey Pine Series. Jeffrey pine (*Pinus jeffreyi*) assumes dominance with ponderosa pine and sugar pine as associates. The elevational range of this series is 6,000 feet to 8,600 feet. Typically, it is on somewhat excessively drained soils formed from granitic rock.

Red Fir Series - This series is within an elevational range of 6,000 feet to 8,800 feet. Red fir (*Abies magnifica*) often grows in pure, dense stands. White fir occurs as an associate within the series. On rocky ridgetops and areas with shallow water tables, red fir may share dominance with lodgepole pine (*Pinus murrayana* var.).

Lodgepole Pine Series - This series grows in open or closed, even-aged stands on cold soils adjacent to meadows. Lodgepole pine is often an indicator of shallow soils or soils with shallow water tables. Lodgepole pine is an important invader species following fire or disturbance. This series generally occurs above 7,000 feet.

Ponderosa Pine Series - The Ponderosa Pine (*Pinus ponderosa*) Series forms an identifiable zone within an elevational range of 3,000 feet to 6,000 feet. This series occurs on xeric soils and is well adapted to low ground fires which cause openings for this light demanding conifer to become established. Incense cedar, sugar pine, and black oak associate with ponderosa pine. Mountain misery (*Chamaebatia foliolosa*) and Mariposa manzanita (*Arctostaphylos mariposa*) are major understory species.

Western White Pine Series - On high elevation (over 8,300 feet), dry, windblown, granitic slopes, western white pine (*P. monticola*) occurs in small groves. On better soil conditions, western white pine associates with red fir, mountain hemlock (*Tsuga mertensiana*), and lodgepole pine.

Mixed Conifer - Pine Series - The codominants of this series are ponderosa pine, and sugar pine. White fir, incense cedar, and various hardwoods may be present in varying amounts. This series occurs between 3,500 feet and 6,700 feet el-

evation. Understory species include mountain misery, mountain whitethorn (*Ceanothus cordulatus*), Mariposa manzanita, and at higher elevations greenleaf manzanita (*A. patula*).

Canyon Live Oak Series - The Canyon Live Oak (*Quercus chrysolepis*) Series finds dominance on shallow soils, near rock outcrops, on south facing slopes at upper elevations, and on steep, north facing slopes at lower elevations. The elevational range is from 1,800 feet to 6,400 feet.

Black Oak/Ponderosa Pine Series - This series consists of stands of black oak with ponderosa pine having 10 to 25 percent of crown closure in the stand. Canyon live oak is an associate. This series is generally on shallow soils on south-facing slopes between 3,000 feet and 6,700 feet elevation.

Blue Oak Series - The Blue Oak (*Quercus douglasii*) Series occurs in an oak-grass association at 1,000 to 4,500 feet elevation in the southern portion of the survey area.

Interior Live Oak Series - The Interior Live Oak (*Q. wislizenii*) Series is at 1,000 feet to 5,000 feet elevation. It often occurs on steep, north-facing slopes. Interior live oak also associates with black oak, canyon live oak, and chaparral species and occasionally in drainages with ponderosa pine.

Greenleaf Manzanita/Jeffrey Pine Series - This series is dominated by greenleaf manzanita (*Arctostaphylos patula*) with Jeffrey pine making up 10 to 25 percent crown closure. It is on shallow soils generally at 6,000 feet to 8,000 feet elevation where the precipitation is less than 40 inches.

Wedgeleaf Ceanothus Series - This series, dominated by wedgeleaf ceanothus (*Ceanothus cuneatus*), occurs on well drained soils on dry, exposed slopes and ridges. This series occurs above 1,000 feet and below 5,000 feet. It may occur as a nearly pure, dense thicket or more open with other shrubs. The associated species include Mariposa manzanita, deerbrush (*Ceanothus integerrimus*), interior live oak, flannel bush (*Fremontia californica*), and buckeye (*Aesculus californica*).

Mariposa Manzanita Series - This Mariposa Manzanita (*Arctostaphylos mariposa*) Series assumes dominance between 1,000 and 6,400 feet particularly on shallow or rocky soil. Whiteleaf manzanita (*A. viscida*) and ponderosa pine are occa-

sional associates. Ponderosa pine makes up less than 10 percent crown closure.

Mariposa Manzanita/Knobcone Pine Series - This series occurs in the Mariposa County portion of the survey area at elevations of 2,500 feet to 4,000 feet. It is dominated by Mariposa manzanita with 10 to 25 percent crown closure of knobcone pine (*Pinus attenuata*).

Mariposa Manzanita/Ponderosa Pine Series - This series is dominated by Mariposa manzanita but has 10 to 25 percent crown closure of ponderosa pine. Elevation is 1,500 feet to 6,400 feet.

Annual Grass-Forb Series - From 1,000 to 5,000 feet annual grasses (*Bromus spp.*, *Festuca spp.*, and *Avena spp.*) dominate small areas. Dominant forbs in this series include Owl's Clover (*Orthocarpus spp.*), Fiddleneck (*Amsinckia intermedia*), and Stork's Bill (*Erodium spp.*). These grasses and forbs may occur in pure stands or contain a light overstory of oaks. Hardwoods and conifers make up less than 10 percent crown closure.

Perennial Grass Series - Within the Red Fir and Lodgepole Pine Series, perennial grasses dominate openings of meadows. Many grasses make up this series (*Poa spp.*, *Danthonia spp.*, and *Deschampsia spp.*). Forbs are also included in this highly diverse series.

Sedge-Rush Series - This series is composed of sedges (*Carex spp.*) and rushes (*Juncus spp.*) and indicates wet conditions. Perennial grasses, forbs, willows, red fir, and lodgepole pine may be associated with the Sedge-Rush Series. This series represents a much wetter site than do the Annual Grass-Forb or Perennial Grass Series.

Soil Profile Description. This is a brief description of the typical, or modal, profile of the soil component. In most instances it is a condensed version of the detailed soil description in the back of the report. This general description combines horizons and includes the thickness, dry color, texture, structure, dry consistence, rock fragment content, and reaction (pH). Miscellaneous areas are also described here.

Surface layer. The uppermost part of the soil, ordinarily moved in tillage, or its equivalent in uncultivated soils; ranging in depth from 3 to 10 inches. Frequently designated as the "A horizon."

Subsoil. The soil between the surface layer and the uppermost substratum. The subsoil consists of all parts of the B horizon above a depth of 2 meters and any part of the A or C horizon between the surface layer and a depth of 1 meter or a more shallow substratum.

Substratum. A layer below a depth of 1 meter, or beneath the solum if the lower part of the solum is between 1 and 2 meters deep. Any part of the solum below 2 meters is considered substratum. Bedrock, hardpan, and unconsolidated geologic materials that are in contrasting particle-size classes relative to the surface soil or solum are substratum regardless of depth, even within 1 meter of the ground surface.

Included Areas. These are areas of soil components or miscellaneous areas that are not identified in the name of the map unit. These areas usually make up a small percentage of the map unit acreage and are not delineated separately for the following reasons: their effect on management is not significantly different, they are too small to be delineated at the scale of mapping, excessive detail of the map would be avoided by including them, or their location cannot be identified practically. Included areas are given because some do affect management significantly and the recognition of all of them will assist with more detailed mapping in the future.

Soil Properties and Management Interpretations

Map Unit Components

These are the soil type(s) and/or miscellaneous area(s) which make up the map unit. Each soil component is then individually interpreted. The interpretations are not applicable on the miscellaneous areas alone, however, the miscellaneous area may have an effect on the rating of the soil component.

Effective rooting depth is the range of depth that the main body of plant roots extend to, generally to shallow bedrock or to a maximum depth of 60 inches. Other limiting layers include hardpans, claypans, or weathered bedrock.

Drainage class refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized.

Excessively drained. Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained. Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained. Water is removed from the soil readily but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained. Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. The soils commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained. Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained. Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, or nearly continuous rainfall, or a combination of these.

Very poorly drained. Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Permeability is the quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are: Very slow (less than 0.06

inch), slow (0.06 to 0.20 inches), moderately slow (0.2 to 0.6 inches), moderate (0.6 to 2.0 inches), moderately rapid (2.0 to 6.0 inches), rapid (6.0 to 20 inches), and very rapid (more than 20 inches).

Available Water Capacity (Inches). This is the capacity of soils to hold water available for use by most plants. This capacity primarily depends on the soil texture, depth, and rock fragment content. Generally, the more clay which is in the soil the more water it can hold. Conversely, the more rock fragments in the soil the less water is held. Available Water Capacity (AWC) is an important factor in the prediction of conifer seedling survival. It is not the only factor and it is not an estimate of the quantity of water actually available to plants at any given time. AWC is expressed as inches of water in a specified number of inches of soil. This guide (10) is based on soil texture. This amount was reduced if rock fragments were present (3). Two depths are estimated:

Upper 20 Inches. AWC is estimated for the top 20 inches of soil as a guide to evaluating the revegetation potential of the soil for planted conifer seedling stock. As a guide, these class limits may be used to categorize the AWC estimate:

Low	Less than 1.2 inches
Medium	1.2 to 2.4 inches
High	More than 2.4 inches

Total. This is the AWC calculated for the whole soil to a maximum depth of 60 inches. The class limits given to this AWC estimate are:

Low	Less than 3.6 inches
Medium	3.6 to 7.2 inches
High	Over 7.2 inches

Hydrologic Soil Group. The Hydrologic Soil Group (HSG) rates the soils according to their ability to accept and transmit water down through the profile. The HSG may be used in conjunction with other factors such as slope and vegetation to estimate the potential surface runoff. The factors used in the rating are infiltration, permeability, and depth at which permeability reduction begins. The methodology of rating the soils was developed by the Soil Conservation Service, USDA. Hydrologists are the most common user of the Hydrologic Soil Group. The four groups are:

Group A - Soils having high infiltration rates even when thoroughly wetted, consisting chiefly of deep, well to excessively drained sands and/or gravel. These soils have a high rate of water transmission and normally result in a low runoff potential.

Group B - Soils having moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately deep to deep, moderately well to well drained soils, with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C - Soils having slow infiltration rates when thoroughly wetted, consisting chiefly of (1) soils with a layer that impedes the downward movement of water, or (2) soils with moderately fine to fine textures and a slow infiltration rate. These soils have a slow rate of water transmission.

Group D - Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission and usually a high runoff potential.

Unified Soil Classification. Unified soil classification is determined according to the Unified soil classification system. This system classifies soil according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. The classification is based on the soil profile description in the map unit. Soils exhibiting engineering properties of two groups can have a dual classification, for example SW-SM. If the classification changes in the soil profile, such as the surface layer is SM and the subsoil is SC, this would be indicated by a “/”, for example SM/SC.

Erosion Factor K. This is one of six factors used by soil scientists in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Factor K is an indicator of the susceptibility of a soil to erode, but should only be used in the USLE equation. The estimates are based primarily on the percentage of silt, sand and organic matter, the soil structure, and permeability of the soil layer being estimated. These estimates were arrived at by using a nomograph (11) and the actual number of a known similar soil.

Maximum Erosion Hazard

Many land use activities have the potential to cause erosion rates to exceed natural soil erosion or soil formation

rates. Potential consequences of accelerated erosion include reductions in the productive capacity of the soil and adverse effects on water quality. Many interrelated factors are evaluated in an EHR system (10) to determine whether land use activities would cause accelerated erosion, and to what degree accelerated erosion would cause adverse effects. It is designed to appraise the relative risk of accelerated sheet and rill erosion. The system does not rate gully erosion, dry ravel, wind erosion, or mass wasting.

The adjective erosion hazard ratings are described below in terms of the likelihood and consequences of accelerated erosion. As the risk of accelerated erosion increases, so does the likelihood that accelerated erosion will exceed soil formation rates. The risk and consequence becomes especially critical for shallow and moderately deep soils over consolidated materials.

The maximum EHR are based on little or no vegetative cover present and on the long-term average occurrence of 2-year, 6-hour storm events. Erosion hazard risks are greater when storm frequency, intensity and/or duration exceed long-term average occurrence, and risks are less when occurrence is below “average”. The risks and consequences for adjective erosion hazard ratings are described below.

Low EHR. Accelerated erosion is not likely to occur, except in the upper part of the Low EHR numerical range, or during periods of above average storm occurrence. If accelerated erosion does occur, adverse effects on soil productivity and to nearby water quality are not expected. Erosion control measures are usually not needed for these areas.

Moderate EHR. Accelerated erosion is likely to occur in most years. Adverse effects on soil productivity (especially to shallow and moderately deep soils) and to nearby water quality may occur for the upper part of the Moderate EHR numerical range, or during periods of above average storm occurrence. The need for erosion control should be evaluated for these areas. A wide selection of measures and application methods are available.

High EHR. Accelerated erosion will occur in most years. Adverse effects on soil productivity (especially to shallow and moderately deep soils) and to nearby water quality are likely to occur, especially during periods of above average storm occurrence. Erosion control is necessary for these areas to prevent accelerated erosion. The selection of measures and methods of application are somewhat limited.

Very high EHR. Accelerated erosion will occur in most years. Adverse effects on soil productivity and to nearby water quality are very likely to occur, even during periods of below average storm occurrence. Erosion control is essential for these areas to prevent accelerated erosion. The selection of measures and methods of application are limited.

Sensitivity. This is a rating of each soil of its susceptibility to a loss of productivity by ground disturbing activities. Soil properties considered in this rating are thickness of the A horizon, depth to bedrock, and the Maximum Erosion Hazard rating. The classes are:

- | | |
|----------|---|
| Low | No potential loss of productivity under intensive uses with appropriate protective measures applied. These soils respond well to management activities. |
| Moderate | A potential loss of productivity under intensive uses unless appropriate measures are applied. |
| High | A potential loss of productivity under most soil disturbing activities, unless other than normal measures are applied. These soils are not well-suited for intensive management activities. |

Soil Manageability. Certain features of the land affect the relative ease of management with mechanized equipment. Soil manageability classification rates soils and their topography on the basis of features that reduce the ease of equipment operation and features that increase the need for soil protection measures.

Soil manageability classes are ratings that are applied to the individual components of a soil map unit. Manageability classes are useful for providing specific information about individual soils. Because map units may

contain soils with contrasting class ratings, soil manageability groups are used to provide general ratings that apply to an entire map unit. Manageability groups are useful for providing general information for large areas.

Soil manageability classes are represented by the numerals 1 to 4. Class 1 is the easiest to manage and class 4 is the most difficult. Letter symbols are added to classes 2, 3, and 4 to identify specific soil problems affecting management. Soil manageability classes are described as follows:

Class 1 - Easy to manage. Soils in this class are on stable slopes with gradients ranging up to about 30 percent. They are moderately deep or deep and do not have more than slight management problems. No management option modifiers apply to this class.

Class 2 - Readily manageable. Soils in this class are mostly on slopes of less than 30 percent and have one or more moderate management limitations, such as a moderate erosion hazard.

Class 3 - Moderately difficult to manage. Soils in this class are on steep slopes that are mostly between 30 and 60 percent, or they have a major management limitation, or both.

Class 4 - Very difficult to manage. Soils in this class are on very steep slopes (more than 60 percent), or they have two or more other major management limitations.

Letter symbols are used to express the severity of potential problems in soil management. Major management option modifiers are identified by capital letters and moderate management modifiers are indicated by lowercase letters. The criteria and symbols for management option modifiers for each soil characteristic or topographic feature are listed in table 1.

TABLE 1. - Soil Features Affecting Management

Soil features	Major modifiers	Moderate modifiers
Slope gradient	G..Mostly more than 60 percent	g..Mostly between 30 and 60 percent
Slope stability	S..Low	s..Moderate
Maximum erosion hazard	E..High or very high	e..Moderate
Soil depth	D..Less than 10 inches	d..10 to 20 inches
AWC, upper 20 inches	P..Less than 1.2 inches	p..1.2 to 2.4 inches
Wetness	W..Poorly drained	w..Somewhat poorly drained
Rock outcrop or surface boulders	X..More than 15 percent of surface	x..3 to 15 percent of surface area

Management option modifiers are chosen in the order in which they are listed. One symbol can be chosen from each of the following groups: (1) symbols G, S, and E (and their lowercase forms); (2) symbols D and P; and (3) symbols W and X. Within each group, symbols for major management limitations take precedence over moderate limitations.

Soil manageability groups are defined by the mix of soil manageability classes that occurs in a soil map unit. They are designated by Roman numerals to distinguish them from soil manageability classes. Only one group applies to a soil map unit, whereas as many classes may apply as there are major components in the map unit. The soil manageability groups in the survey area are defined as follows:

Group I - Map unit is predominantly class 1. Less than 20 percent of the unit is class 3 or class 4. The unit may be no more than 50 percent class 2, or combinations of classes 2, 3, and 4.

Group II - Map unit is predominantly class 2. Less than 20 percent of the unit is class 4. Less than 50 percent of the unit is class 3 or a combination of classes 3 and 4.

Group III - Map unit is predominantly class 3. Less than 40 percent of the unit is class 4.

Group IV - Map unit is at least 40 percent class 4.

A soil map unit is placed in the group with the lowest numeral if group definitions allow the unit to be placed in more than one soil manageability group.

Annual Forage Production (Lbs/Ac). This is an estimate of the pounds of forage produced on an acre in one year. Forage is the plant material which is available to and consumed by domestic livestock. The estimates are based on an average year, under natural conditions, and on a dry weight basis. There are four classes of forage production: Less than 200, 200 to 600, 600 to 1,200, and 1,200 to 2,000 pounds/acre.

Forest Survey Site Class. The timber productivity of the soil components is expressed by the Forest Survey Site Class (FSSC). The FSSC estimated for each soil component is an average over the map unit. FSSC was determined by using available site index data and converting to FSSC by using a guide (5). Some site index data was obtained from the Fresno-Sierra Soil-Vegetation Survey (13). On a specific site in the map unit, FSSC might be more or less than what is given in the report. FSSC is an expression of the volume of

bole wood produced on an acre in one year in a normal even-aged stand at culmination mean annual increment. Below are the seven FSSC's and their corresponding volume in cubic feet per acre:

1	greater than 225
2	165 to 225
3	120 to 165
4	85 to 120
5	50 to 85
6	20 to 50
7	less than 20

The term NC means not capable of growing commercial conifer species.

Remarks

Comments about the map unit are given in Remarks. The comments are normally unique to the particular map unit, important to the management of the map unit, or they add further explanation to something previously stated in this section.

101 Ahwahnee family, 5 to 35 percent slopes

Elevation: 1,000 to 2,700 feet Annual Precipitation: 25 to 30 inches

Map Unit Components	Ahwahnee family
Approximate Proportion	85 percent
Landscape Position	Foothills, mountainsides, and ridges
Slope	5 to 35 percent
Typical Vegetation Series	Interior Live Oak, Blue Oak

Soil Profile Description

Surface Layer	0 to 8 inches; grayish brown coarse sandy loam; massive; slightly hard; pH 5.8
Subsoil	8 to 29 inches; yellowish brown coarse sandy loam; massive; hard; pH 6.0
Substratum	29 inches; weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 60"
Drainage	Well drained
Permeability	Moderately rapid
Available Water Capacity	
Upper 20 inches	1.5" to 1.9"
Total	1.5" to 7.3"
Hydrologic Soil Group	B
Unified Soil Classification	SM
Erosion Factor K	.24
Maximum Erosion Hazard	Moderate and high
Sensitivity	Low and moderate
Soil Manageability Class	1e
Annual Forage Production	600 to 1,200 lbs/acre
Forest Survey Site Class	NC
Manageability Group	I
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop, soils in the Auberry family, soils that are less than 20 inches deep, and soils that are similar to the Ahwahnee family but are darker or less developed. Included areas make up about 15 percent of the map unit area. The maximum erosion hazard for this soil is moderate on slopes of 5 to 15 percent and high on slopes of 15 to 35 percent. Sensitivity is low on slopes of 5 to 15 percent and moderate on slopes of 15 to 35 percent. In some areas, on private land, this soil is used for growing cereal crops.

102 Ahwahnee family, 35 to 65 percent slopes

1,000 to 2,700 feet

Annual Precipitation: 25 to 30 inches

Map Unit Components	Ahwahnee family
Approximate Proportion	85 percent
Landscape Position	Mountainsides
Slope	35 to 65 percent
Typical Vegetation Series	Interior Live Oak, Wedgeleaf Ceanothus

Soil Profile Description

Surface Layer	0 to 8 inches; grayish brown coarse sandy loam; massive; slightly hard; pH 5.8
Subsoil	8 to 29 inches; yellowish brown coarse sandy loam; massive; hard; pH 6.0
Substratum	29 inches; weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 60"
Drainage	Well drained
Permeability	Moderately rapid
Available Water Capacity	
Upper 20 inches	1.5" to 1.9"
Total	1.5" to 7.3"
Hydrologic Soil Group	B
Unified Soil Classification	SM
Erosion Factor K	.24
Maximum Erosion Hazard	High and very high
Sensitivity	Moderate and high
Soil Manageability Class	3E
Annual Forage Production	600 to 1,200 lbs/acre
Forest Survey Site Class	NC
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop, soils less than 20 inches deep, soils in the Auberry family on concave slopes of 35 to 45 percent, and soils that are similar to the Ahwahnee family but are less developed. Included areas make up about 15 percent of the map unit area. The maximum erosion hazard for this soil is high on slopes of 35 to 50 percent and very high on slopes over 50 percent. Sensitivity is moderate on slopes of 35 to 50 percent and high on slopes over 50 percent.

103 Ahwahnee family - Rock outcrop complex, 35 to 75 percent slopes

Elevation: 1,000 to 3,000 feet Annual Precipitation: 25 to 35 inches

Map Unit Components	Ahwahnee family	Rock outcrop
Approximate Proportion	65 percent	20 percent
Landscape Position	Mountainsides	Mountainsides: intermingled with soils
Slope	35 to 75 percent	
Typical Vegetation Series	Blue Oak, Wedgeleaf Ceanothus, Mariposa Manzanita	

Soil Profile Description

Surface Layer	0 to 8 inches; grayish brown coarse sandy loam; massive; slightly hard; pH 5.8	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	8 to 29 inches; yellowish brown coarse sandy loam; massive; hard; pH 6.0	
Substratum	29 inches; weathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 60"
Drainage	Well drained
Permeability	Moderately rapid
Available Water Capacity	
Upper 20 inches	1.5" to 1.9"
Total	1.5" to 7.3"
Hydrologic Soil Group	B
Unified Soil Classification	SM
Erosion Factor K	.24
Maximum Erosion Hazard	High and very high
Sensitivity	Moderate and high
Soil Manageability Class	4EX
Annual Forage Production	200 to 600 lbs/acre
Forest Survey Site Class	NC
Manageability Group	IV
Included Areas and Remarks:	Included in this unit are small areas of soils similar to the Ahwahnee family but are darker or less developed, soils that are less than 20 inches deep on slopes greater than 45 percent, and soils in the Auberry family on slopes of less than 45 percent. Included areas make up about 15 percent of the map unit area. Ahwahnee family soils have maximum erosion hazard of high on slopes of 35 to 50 percent and very high on slopes over 50 percent. Sensitivity is moderate on slopes of 35 to 50 percent and high on slopes over 50 percent.

104 Aquic Dystric Xerochrepts, 1 to 15 percent slopes

Elevation: 6,700 to 7,600 feet Annual Precipitation: 50 to 55 inches

Map Unit Components	Aquic Dystric Xerochrepts
Approximate Proportion	85 percent
Landscape Position	Glacial outwash plains and mountainsides
Slope	1 to 15 percent
Typical Vegetation Series	Lodgepole Pine, Red Fir

Soil Profile Description

Surface Layer	0 to 5 inches; very dark grayish brown sandy loam; weak granular structure; slightly hard; pH 5.4
Subsoil	5 to 48 inches; light yellowish brown cobbly coarse sandy loam; common to many mottles; weak subangular blocky structure; hard; 20 percent rock fragments; pH 5.6
Substratum	48 to 60 inches; light brownish gray very dense basal till; coarse sandy loam; massive; extremely hard; pH 6.2

Soil Properties & Management Interpretations

Effective Rooting Depth	28" to 60"
Drainage	Somewhat poorly drained
Permeability	Moderate
Available Water Capacity	
Upper 20 inches	1.8" to 2.0"
Total	6.0" to 6.8"
Hydrologic Soil Group	B
Unified Soil Classification	SM/SM/SC
Erosion Factor K	.24
Maximum Erosion Hazard	Moderate
Sensitivity	Low
Soil Manageability Class	2W
Annual Forage Production	200 to 600 lbs/acre
Forest Survey Site Class	4
Manageability Group	II
Included Areas and Remarks:	Included in this unit are small areas of soils that support Sedge-Rush vegetation, have thick organic surface layers, are in low lying areas, and are occasionally flooded. Also included are soils in the Umpa family on morainal ridges, and Lithic Xeropsamments and Rock outcrop on ridges between drainages. Included areas make up about 15 percent of the map unit area. This soil formed over compacted glacial till which restricts the downward movement of water. Typically, the water table is at about 3 feet and it rises when the vegetation is removed. Most of this unit is in the Jackass Meadow area on the Minarets Ranger District.

105 Auberry family, 5 to 35 percent slopes

Elevation: 1,000 to 2,700 feet Annual Precipitation: 25 to 30 inches

Map Unit Components	Auberry family
Approximate Proportion	85 percent
Landscape Position	Foothills, mountainsides, ridges, and upland basins
Slope	5 to 35 percent
Typical Vegetation Series	Interior Live Oak, Blue Oak, Annual Grass-Forb

Soil Profile Description

Surface Layer	0 to 17 inches; brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.4
Subsoil	17 to 29 inches; strong brown sandy clay loam; moderate subangular blocky structure; very hard; pH 5.7 29 to 62 inches; light yellowish brown coarse sandy loam; weak subangular blocky structure; very hard; pH 5.5
Substratum	62 inches; weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	30" to 80"
Drainage	Well drained
Permeability	Moderate
Available Water Capacity	
Upper 20 inches	1.7" to 2.1"
Total	4.0" to 7.1"
Hydrologic Soil Group	B
Unified Soil Classification	SM/SC,SM
Erosion Factor K	.24
Maximum Erosion Hazard	Moderate and high
Sensitivity	Low and moderate
Soil Manageability Class	1e
Annual Forage Production	600 to 1,200 lbs/acre
Forest Survey Site Class	NC
Manageability Group	I
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop, soils in the Ahwahnee family, and soils that are similar to the Auberry family but are darker. Included areas make up about 15 percent of the map unit area. The maximum erosion hazard for this soil is moderate on slopes of 5 to 15 percent and high on slopes of 15 to 35 percent. Sensitivity is low on slopes of 5 to 15 percent and moderate on slopes of 15 to 35 percent. Unsurfaced roads and trails are subject to gullyng on this soil, particularly when the subsoil is exposed. Typically, the Annual Gross - Forb vegetation series is on private land. This land has been cleared to increase the grazing potential.

106 Auberry family, 35 to 65 percent slopes

Elevation: 1,000 to 3,500 feet Annual Precipitation: 25 to 30 inches

Map Unit Components	Auberry family
Approximate Proportion	85 percent
Landscape Position	Foothills and mountainsides
Slope	35 to 65 percent
Typical Vegetation Series	Blue Oak, Interior Live Oak

Soil Profile Description

Surface Layer	0 to 17 inches; brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.4.
Subsoil	17 to 29 inches; strong brown sandy clay loam; moderate subangular blocky structure; very hard; pH 5.7
	29 to 62 inches; light yellowish brown coarse sandy loam; weak subangular blocky structure; very hard; pH 5.5
Substratum	62 inches; weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	30" to 80"
Drainage	Well drained
Permeability	Moderate
Available Water Capacity	
Upper 20 inches	1.7" to 2.1"
Total	4.0" to 7.1"
Hydrologic Soil Group	B
Unified Soil Classification	SM/SC,SM
Erosion Factor K	.24
Maximum Erosion Hazard	High and very high
Sensitivity	Moderate and high
Soil Manageability Class	3E
Annual Forage Production	600 to 1,200 lbs/acre
Forest Survey Site Class	NC
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop, soils in the Ahwahnee and Tollhouse families, and soils similar to the Auberry family but are darker on concave slopes of 35 to 45 percent. Included areas make up about 15 percent of the map unit area. The maximum erosion hazard for this soil is high on slopes of 35 to 50 percent and very high on slopes over 50 percent. Sensitivity is moderate on slopes of 35 to 50 percent and high on slopes over 50 percent.

107 Auberry - Ahwahnee families association, 5 to 35 percent slopes

Elevation: 1,000 to 2,800 feet Annual Precipitation: 25 to 30 inches

Map Unit Components	Auberry family	Ahwahnee family
Approximate Proportion	55 percent	35 percent
Landscape Position	Mountainsides, broad ridges, and foothills	Mountainsides, broad ridges, and foothills
Slope	5 to 35 percent	5 to 35 percent
Typical Vegetation Series	Interior Live Oak, Blue Oak, Wedgeleaf Ceanothus	Interior Live Oak, Blue Oak, Wedgeleaf Ceanothus

Soil Profile Description

Surface Layer	0 to 17 inches; brown coarse sandy loam, weak subangular blocky structure; slightly hard; pH 6.4	0 to 8 inches; grayish brown coarse sandy loam; massive; slightly hard; pH 5.8.
Subsoil	17 to 29 inches; strong brown sandy clay loam; moderate subangular blocky structure; very hard; pH 5.7 29 to 62 inches; light yellowish brown coarse sandy loam; weak subangular blocky structure; very hard; pH 5.5	8 to 29 inches; yellowish brown coarse sandy loam; massive; hard; pH 6.0
Substratum	62 inches; weathered granodiorite	29 inches; weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	30" to 80"	20" to 60"
Drainage	Well drained	Well drained
Permeability	Moderate	Moderately rapid
Available Water Capacity		
Upper 20 inches	1.7 to 2.1	1.5 to 1.9
Total	4.0 to 7.1	1.5 to 7.3
Hydrologic Soil Group	B	B
Unified Soil Classification	SM/SC,SM	SM
Erosion Factor K	.24	.24
Maximum Erosion Hazard	Moderate and High	Moderate and high
Sensitivity	Low and moderate	Low and moderate
Soil Manageability Class	1e	1e
Annual Forage Production	600 to 1,200 lbs/acre	600 to 1,200 lbs/acre
Forest Survey Site Class	NC	NC
Manageability Group	I	I
Included Areas and Remarks:	Included in this map unit are small areas of Rock outcrop and soils similar to the Auberry and Ahwahnee families but have thicker and darker surface horizons. Also included are soils less than 20 inches deep along drainages and near Rock outcrop. Included areas make up about 10 percent of the map unit area. The maximum erosion hazard for these soils is moderate on slopes of 5 to 15 percent and high on slopes of 15 to 35 percent. These soils have sensitivity of low on slopes of 5 to 15 percent and moderate on slopes of 15 to 35 percent. Nonsurfaced roads and trails are subject to gully erosion.	

108 Auberry - Ahwahnee families association, 35 to 65 percent slopes

Elevation: 1,000 to 3,300 feet Annual Precipitation: 20 to 30 inches

Map Unit Components	Auberry family	Ahwahnee family
Approximate Proportion	45 percent	40 percent
Landscape Position	Mountainsides	Mountainsides
Slope	35 to 65 percent	35 to 65 percent
Typical Vegetation Series	Interior Live Oak	Interior Live Oak

Soil Profile Description

Surface Layer	0 to 17 inches; brown coarse sandy loam, weak subangular blocky structure; slightly hard; pH 6.4	0 to 8 inches; grayish brown coarse sandy loam; massive; slightly hard; pH 5.8
Subsoil	17 to 29 inches; strong brown sandy clay loam; moderate subangular blocky structure; very hard; pH 5.7	8 to 29 inches; yellowish brown coarse sandy loam; massive; hard; pH 6.0
	29 to 62 inches; light yellowish brown coarse sandy loam; weak subangular blocky structure; very hard; pH 5.5	
Substratum	62 inches; weathered granodiorite	29 inches; weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	30" to 80"	20" to 60"
Drainage	Well drained	Well drained
Permeability	Moderate	Moderately rapid
Available Water Capacity		
Upper 20 inches	1.7 to 2.1	1.5 to 1.9
Total	4.0 to 7.1	1.5 to 7.3
Hydrologic Soil Group	B	B
Unified Soil Classification	SM/SC,SM	SM
Erosion Factor K	.24	.24
Maximum Erosion Hazard	High and very high	High and very high
Sensitivity	Moderate and high	Moderate and high
Soil Manageability Class	3E	3E
Annual Forage Production	600 to 1,200 lbs/acre	600 to 1,200 lbs/acre
Forest Survey Site Class	NC	NC
Manageability Group	III	III
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop, soils similar to the Auberry and Ahwahnee families on ridges with slopes less than 35 percent, and soils in the Tollhouse family. Included areas make up about 15 percent of the map unit area. The maximum erosion hazard for these soils is high on slopes of 35 to 50 percent and very high on slopes over 50 percent. These soils have sensitivity of moderate on slopes of 35 to 50 percent and high on slopes over 50 percent.	

109 Auberry family - Rock outcrop complex, 35 to 75 percent slopes

Elevation: 1,000 to 3,000 feet Annual Precipitation: 20 to 30 inches

Map Unit Components	Auberry family	Rock outcrop
Approximate Proportion	55 percent	25 percent
Landscape Position	Mountainsides	Mountainsides; intermingled with soils
Slope	35 to 75 percent	
Typical Vegetation Series	Interior Live Oak, Mariposa Manzanita	

Soil Profile Description

Surface Layer	0 to 17 inches; brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.4	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	17 to 29 inches; strong brown sandy clay loam; moderate subangular blocky structure; very hard; pH 5.7	
	29 to 62 inches; light yellowish brown coarse sandy loam; weak subangular blocky structure; very hard; pH 5.5	
Substratum	62 inches; weathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	30" to 80"
Drainage	Well drained
Permeability	Moderate
Available Water Capacity	
Upper 20 inches	1.7 to 2.1
Total	4.0 to 7.1
Hydrologic Soil Group	B
Unified Soil Classification	SM/SC,SM
Erosion Factor K	.24
Maximum Erosion Hazard	High and very high
Sensitivity	Moderate and high
Soil Manageability Class	4EX
Annual Forage Production	200 to 600 lbs/acre
Forest Survey Site Class	NC
Manageability Group	IV
Included Areas and Remarks:	Included in this unit are small areas of soils in the Ahwahnee and Tollhouse families. Included areas make up about 20 percent of the map unit area. Soils in the Auberry family have maximum erosion hazard of high on slopes of 35 to 50 percent and very high on slopes over 50 percent. The sensitivity for soils in the Auberry family is moderate on slopes of 35 to 50 percent and high on slopes over 50 percent.

110 Auberry - Tollhouse families - Rock outcrop association, 25 to 65 percent slopes

Elevation: 1,800 to 3,800 feet Annual Precipitation: 20 to 30 inches

Map Unit Components	Auberry family	Tollhouse family	Rock Outcrop
Approximate Proportion	35 percent	35 percent	15 percent
Landscape Position	Mountainsides: concave slopes	Mountainsides: convex slopes	Mountainsides: normally adjacent to Tollhouse family
Slope	25 to 45 percent	45 to 65 percent	
Typical Vegetation Series	Interior Live Oak, Canyon Live Oak	Interior Live Oak, Canyon Live Oak, Wedgeleaf Ceanothus	

Soil Profile Description

Surface Layer	0 to 17 inches; brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.4	0 to 18 inches; dark grayish brown gravelly coarse sandy loam; moderate granular structure; soft; 15 percent pebbles; pH 6.2	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	17 to 29 inches; strong brown sandy clay loam; moderate subangular blocky structure; very hard; pH 5.7		
	29 to 62 inches; light yellowish brown coarse sandy loam; weak subangular blocky structure; very hard; pH 5.5		
Substratum	62 inches; weathered granodiorite	18 inches; weathered quartz diorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	30" to 80"	14" to 20"
Drainage	Well drained	Somewhat excessively drained
Permeability	Moderate	Moderately rapid
Available Water Capacity		
Upper 20 inches	1.7 to 2.1	1.3 to 1.8
Total	4.0 to 7.1	1.3 to 1.8
Hydrologic Soil Group	B	D
Unified Soil Classification	SM/SC,SM	SM
Erosion Factor K	.24	.20
Maximum Erosion Hazard	High	High
Sensitivity	Moderate	High
Soil Manageability Class	3e	4edx
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	NC	NC
Manageability Group	III	III
Included Areas and Remarks:	Included in this unit are small areas of soils in the Ahwahnee family on south-facing slopes and soils similar to the Auberry family but are cooler, or darker and less developed on north-facing slopes. Also included are soils similar to the Tollhouse family but are deeper on north-facing slopes or are warmer on south-facing slopes below 2,700 feet. Included areas make up about 15 percent of the map unit area.	

111 Cagwin family, 25 to 60 percent slopes

Elevation: 6,000 to 8,500 feet Annual Precipitation: 30 to 55 inches

Map Unit Components	Cagwin family
Approximate Proportion	80 percent
Landscape Position	Mountainsides
Slope	25 to 60 percent
Typical Vegetation Series	Jeffrey Pine, Red Fir, Mixed Conifer-Fir

Soil Profile Description

Surface Layer	0 to 5 inches; dark gray loamy coarse sand; single grain; loose; pH 5.4
Subsoil	5 to 32 inches; very pale brown gravelly loamy coarse sand; single grain; soft; 15 percent pebbles; pH 5.5
Substratum	32 inches; highly weathered granitic rock

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 40"
Drainage	Somewhat excessively drained
Permeability	Rapid
Available Water Capacity	
Upper 20 inches	1.1 to 1.4
Total	1.1 to 2.5
Hydrologic Soil Group	A
Unified Soil Classification	SM
Erosion Factor K	.17
Maximum Erosion Hazard	Moderate and high
Sensitivity	Moderate and high
Soil Manageability Class	3e
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	3 and 4
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop, soils in the Cagwin family which are 40 to 60 inches deep, and Lithic Xeropsamments. Also included are soils similar to the Cagwin family except they have darker colors or more than 35 percent rock fragments. Included areas make up about 20 percent of the map unit area. The maximum erosion hazard and the sensitivity of the soil is moderate on slopes of 25 to 35 percent and high on slopes over 35 percent. The potential for dry ravel is increased on steep slopes without protective cover.

112 Cagwin - Cannell families complex, 2 to 25 percent slopes

Elevation: 6,000 to 8,400 feet Annual Precipitation: 35 to 55 inches

Map Unit Components
Approximate Proportion
Landscape Position
Slope
Typical Vegetation Series

Cagwin family

70 percent
Upland basins and toeslopes
2 to 25 percent
Jeffrey Pine, Mixed Conifer-Fir

Cannell family

20 percent
Toeslopes and upland basins
2 to 15 percent
Jeffrey Pine, Mixed Conifer-Fir

Soil Profile Description

Surface Layer

0 to 7 inches; brown gravelly loamy coarse sand; weak granular structure; soft; 20 percent pebbles; pH 6.5

0 to 7 inches; grayish brown gravelly coarse sandy loam; weak granular structure; soft; 15 percent pebbles; pH 6.0

Subsoil

7 to 45 inches; light yellowish brown gravelly loamy coarse sand; massive; slightly hard; 25 percent pebbles; pH 6.5

7 to 32 inches; very pale brown gravelly coarse sandy loam; massive; slightly hard; 20 percent pebbles; pH 6.0

Substratum

32 to 50 inches; very pale brown gravelly loamy coarse sand; massive; slightly hard; 25 percent pebbles; pH 6.0

50 inches; highly weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth

40" to 60"

40" to 80"

Drainage

Somewhat excessively drained

Well drained

Permeability

Rapid

Moderately rapid

Available Water Capacity

Upper 20 inches

1.1 to 1.4

1.5 to 1.9

Total

2.5 to 4.0

3.6 to 5.4

Hydrologic Soil Group

A

B

Unified Soil Classification

SM

SM

Erosion Factor K

.17

.24

Maximum Erosion Hazard

High

High

Sensitivity

Moderate

Low

Soil Manageability Class

1e

1e

Annual Forage Production

200 to 600 lbs/acre

200 to 600 lbs/acre

Forest Survey Site Class

3 and 4

3

Manageability Group

I

I

Included Areas and Remarks:

Included in this unit are small areas of Rock outcrop and Aquic Dystric Xerochrepts in low-lying wet areas. Included areas make up about 10 percent of the map unit area. The erosion hazard of these soils is increased if there is Rock outcrop above the unit. These soils have high maximum erosion hazard because of their susceptibility to severe gully erosion.

113 Cagwin family - Lithic Xeropsamments - Rock outcrop complex, 15 to 45 percent slopes

Elevation: 6,000 to 8,400 feet Annual Precipitation: 35 to 55 inches

Map Unit Components	Cagwin family	Lithic Xeropsamments	Rock outcrop
Approximate Proportion	55 percent	20 percent	15 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges	Mountainsides and ridges
Slope	15 to 45 percent	15 to 45 percent	
Typical Vegetation Series	Jeffrey Pine, Mixed Conifer-Fir	Greenleaf Manzanita/Jeffrey Pine	

Soil Profile Description

Surface Layer	0 to 5 inches; dark gray loamy coarse sand; single grain; loose; pH 5.4	0 to 11 inches; brown gravelly loamy coarse sand; single grain; loose; 15 percent pebbles; pH 5.6	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	5 to 32 inches; very pale brown gravelly loamy coarse sand; single grain; soft; 15 percent pebbles; pH 5.5		
Substratum	32 inches; highly weathered granitic rock	11 inches; unweathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 40"	4" to 20"
Drainage	Somewhat excessively drained	Excessively drained
Permeability	Rapid	Rapid
Available Water Capacity		
Upper 20 inches	1.1 to 1.4	0.3 to 1.5
Total	1.1 to 2.5	0.3 to 1.5
Hydrologic Soil Group	A	D
Unified Soil Classification	SM	SW-SM
Erosion Factor K	.17	.17
Maximum Erosion Hazard	Moderate and high	High
Sensitivity	Moderate and high	High
Soil Manageability Class	3ex	3Dex
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	5	6 and 7
Manageability Group	III	III

Included Areas and Remarks: Included in this unit are small areas of soils similar to the Cagwin family and Lithic Xeropsamments except they have more than 35 percent rock fragments. Also included are soils similar to Lithic Xeropsamments which are on highly weathered parent rock. Included areas make up about 10 percent of the map unit area. The maximum erosion hazard and the sensitivity for soils in the Cagwin family is moderate on 15 to 35 percent slopes and high on 35 to 45 percent slopes. Lithic Xeropsamments have poor artificial regeneration potential and are very difficult to hand plant. Clearcuts on these soils dry out quickly in the spring and may be dry before roads are open into the area. A mulch would help reduce soil evapotranspiration and temperature. Productivity of these soils is reduced by ground disturbing activities. Erosion hazard is increased if this unit is below massive rock outcrop exposures.

114 Cagwin family - Lithic Xeropsamments - Rock outcrop complex, 45 to 65 percent slopes

Elevation: 5,600 to 8,400 feet Annual Precipitation: 35 to 55 inches

Map Unit Components	Cagwin family	Lithic Xeropsamments	Rock outcrop
Approximate Proportion	55 percent	20 percent	15 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges	Mountainsides and ridges
Slope	45 to 65 percent	45 to 65 percent	
Typical Vegetation Series	Jeffrey Pine, Mixed Conifer-Fir	Greenleaf Manzanita/Jeffrey Pine	

Soil Profile Description

Surface Layer	0 to 5 inches; dark gray loamy coarse sand; single grain; loose; pH 5.4	0 to 11 inches; brown gravelly loamy coarse sand; single grain; loose; 15 percent pebbles; pH 5.6	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	5 to 32 inches; very pale brown gravelly loamy coarse sand; single grain; soft; 15 percent pebbles; pH 5.5		
Substratum	32 inches; highly weathered granitic rock	11 inches; unweathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 40"	4" to 20"
Drainage	Somewhat excessively drained	Excessive drained
Permeability	Rapid	Rapid
Available Water Capacity		
Upper 20 inches	1.1 to 1.4	0.3 to 1.5
Total	1.1 to 2.5	0.3 to 1.5
Hydrologic Soil Group	A	D
Unified Soil Classification	SM	SW-SM
Erosion Factor K	.17	.17
Maximum Erosion Hazard	High	Very high
Sensitivity	High	High
Soil Manageability Class	3ex	4EDx
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	5	6 and 7
Manageability Group	III	III
Included Areas and Remarks:	Included in this unit are small areas of soils similar to the Cagwin family and Lithic Xeropsamments except they have more than 35 percent rock fragments, and soils similar to Lithic Xeropsamments which are on highly weathered parent rock. Included areas make up about 10 percent of the map unit area. These soils have poor artificial regeneration potential and are very sensitive to disturbance. Large openings are extremely difficult to regenerate.	

115 Cagwin family - Rock outcrop complex, 15 to 35 percent slopes

Elevation: 6,200 to 8,300 feet Annual Precipitation: 40 to 55 inches

Map Unit Components	Cagwin family	Rock outcrop
Approximate Proportion	75 percent	15 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges
Slope	15 to 35 percent	
Typical Vegetation Series	Jeffrey Pine, Mixed Conifer-Fir	

Soil Profile Description

Surface Layer	0 to 5 inches; dark gray loamy coarse sand; single grain; loose; pH 5.4	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	5 to 32 inches; very pale brown gravelly loamy coarse sand; single grain; soft; 15 percent pebbles; pH 5.5	
Substratum	32 inches; highly weathered granitic rock	

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 40"	
Drainage	Somewhat excessively drained	
Permeability	Rapid	
Available Water Capacity		
Upper 20 inches	1.1 to 1.4	
Total	1.1 to 2.5	
Hydrologic Soil Group	A	
Unified Soil Classification	SM	
Erosion Factor K	.17	
Maximum Erosion Hazard	Moderate	
Sensitivity	Moderate	
Soil Manageability Class	1x	
Annual Forage Production	Less than 200 lbs/acre	
Forest Survey Site Class	4 and 5	
Manageability Group	I	
Included Areas and Remarks:	Included in this unit are small areas of soils similar to the Cagwin family but are 40 to 60 inches deep, and Lithic Xeropsamments adjacent to the Rock outcrop. Included areas make up about 10 percent of the map unit area.	

116 Cagwin family - Rock outcrop complex, 35 to 65 percent slopes

Elevation: 6,200 to 8,300 feet Annual Precipitation: 35 to 55 inches

Map Unit Components	Cagwin family	Rock outcrop
Approximate Proportion	70 percent	15 percent
Landscape Position	Mountainsides	Mountainsides
Slope	35 to 65 percent	
Typical Vegetation Series	Jeffrey Pine, Mixed Conifer-Fir	

Soil Profile Description

Surface Layer	0 to 5 inches; dark gray loamy coarse sand; single grain; loose; pH 5.4
Subsoil	5 to 32 inches; very pale brown gravelly loamy coarse sand; single grain; soft; 15 percent pebbles; pH 5.5
Substratum	32 inches; highly weathered granitic rock

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 40"
Drainage	Somewhat excessively drained
Permeability	Rapid
Available Water Capacity	
Upper 20 inches	1.1 to 1.4
Total	1.1 to 2.5
Hydrologic Soil Group	A
Unified Soil Classification	SM
Erosion Factor K	.17
Maximum Erosion Hazard	High
Sensitivity	High
Soil Manageability Class	3ex
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	4 and 5
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of soils similar to the Cagwin family but are 40 to 60 inches deep on 35 to 45 percent slopes, soils in the Cannell family, soils in the Sirretta family on colluvial slopes, and Lithic Xeropsamments near the Rock outcrop on 55 to 65 percent slopes. Included areas make up about 15 percent of the map unit area. Gullyng on skid trials may be a problem without adequate water bars.

117 Cannell family, 15 to 45 percent slopes

Elevation: 6,400 to 7,600 feet Annual Precipitation: 40 to 50 inches

Map Unit Components	Cannell family
Approximate Proportion	85 percent
Landscape Position	Mountainsides
Slope	15 to 45 percent
Typical Vegetation Series	Red Fir

Soil Profile Description

Surface Layer	0 to 7 inches; grayish brown gravelly coarse sandy loam; weak granular structure; soft; 15 percent pebbles; pH 6.0
Subsoil	7 to 32 inches; very pale brown gravelly coarse sandy loam; massive; slightly hard; 20 percent pebbles; pH 6.0 32 to 50 inches; very pale brown gravelly loamy coarse sand; massive; slightly hard; 25 percent pebbles; pH 6.0
Substratum	50 inches; highly weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	40" to 80"
Drainage	Well drained
Permeability	Moderately rapid
Available Water Capacity	
Upper 20 inches	1.6 to 1.8
Total	3.6 to 5.4
Hydrologic Soil Group	B
Unified Soil Classification	SM
Erosion Factor K	.24
Maximum Erosion Hazard	Moderate
Sensitivity	Low and moderate
Soil Manageability Class	3
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	3
Manageability Group	III

Included Areas and Remarks: Included in this unit are small areas of Umpa family, deep soils in the area north of Cold Springs Meadow, soils in the Cagwin family on 25 to 45 percent slopes, and Aquic Dystric Xerochrepts on 5 to 15 percent slopes. Included areas make up about 15 percent of the map unit area. This unit is mainly in the vicinity of Beasore Meadows. This soil shows very good natural regeneration capability. Road dust is high on this soil. Sensitivity is low on slopes of 15 to 35 percent and moderate on slopes of 35 to 45 percent.

118 Chaix family, 5 to 35 percent slopes

Elevation: 3,500 to 6,700 feet Annual Precipitation: 30 to 45 inches

Map Unit Components	Chaix family
Approximate Proportion	80 percent
Landscape Position	Mountainsides and ridges
Slope	5 to 35 percent
Typical Vegetation Series	Ponderosa Pine, Mixed Conifer-Pine

Soil Profile Description

Surface Layer	0 to 6 inches; grayish brown coarse sandy loam; moderate granular structure; slightly hard; pH 6.2
Subsoil	6 to 36 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.0
Substratum	36 inches; highly weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 60"
Drainage	Somewhat excessively drained
Permeability	Moderately rapid
Available Water Capacity	
Upper 20 inches	1.7 to 2.0
Total	1.7 to 6.6
Hydrologic Soil Group	B
Unified Soil Classification	SM
Erosion Factor K	.24
Maximum Erosion Hazard	Moderate and high
Sensitivity	Moderate
Soil Manageability Class	1e
Annual Forage Production	200 to 600 lbs/acre
Forest Survey Site Class	4
Manageability Group	I
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop, soils in the Chawanakee family on ridges, and soils similar to the Chaix, deep and Chaix families but have loamy sand texture. Also included are soils in the Kaiser Diggings Station area that are similar to the Chaix family, deep soils but are over 80 inches deep and are forming in glaciofluvial material. Included areas make up about 20 percent of the map unit area. The maximum erosion hazard for this soil is moderate on slopes of 5 to 15 percent and high on slopes of 15 to 35 percent. Typically, this unit is under semi-open stands of ponderosa pine with little understory.

119 Chaix family, 35 to 65 percent slopes

Elevation: 3,000 to 6,400 feet Annual Precipitation: 30 to 45 inches

Map Unit Components	Chaix family
Approximate Proportion	80 percent
Landscape Position	Mountainsides and ridges
Slope	35 to 65 percent
Typical Vegetation Series	Ponderosa Pine, Mixed Conifer-Pine

Soil Profile Description

Surface Layer	0 to 6 inches; grayish brown coarse sandy loam; moderate granular structure; slightly hard; pH 6.2
Subsoil	6 to 36 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.0
Substratum	36 inches; highly weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 60"
Drainage	Somewhat excessively drained
Permeability	Moderately rapid
Available Water Capacity	
Upper 20 inches	1.7 to 2.0
Total	1.7 to 6.6
Hydrologic Soil Group	B
Unified Soil Classification	SM
Erosion Factor K	.24
Maximum Erosion Hazard	High and very high
Sensitivity	Moderate and high
Soil Manageability Class	3E
Annual Forage Production	200 to 600 lbs/acre
Forest Survey Site Class	4 and 5
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop, soils in the Chawanakee and Chaix, deep families, and soils similar to the Chaix family but have loamy sand subsoils. Included areas make up about 20 percent of the map unit area. The maximum erosion hazard for this soil is high on slopes of 35 to 50 percent and very high on slopes over 50 percent. Sensitivity is moderate on slopes less than 50 percent and high on slopes more than 50 percent. Regeneration potential is poor on south-facing unprotected sites.

120 Chaix family, deep, 5 to 45 percent slopes

Elevation: 4,800 to 6,000 feet Annual Precipitation: 40 to 50 inches

Map Unit Components	Chaix family, deep
Approximate Proportion	75 percent
Landscape Position	Mountainsides and upland basins
Slope	5 to 45 percent
Typical Vegetation Series	Mixed Conifer-Pine, Mixed Conifer-Fir, Big Tree

Soil Profile Description

Surface Layer	0 to 14 inches; pale brown sandy loam; weak subangular blocky structure parting to weak granular; soft; pH 6.0
Subsoil	14 to 54 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 5.8
Substratum	54 to 60 inches; very pale brown gravelly coarse sandy loam; massive; soft; 20 percent pebbles; pH 5.6

Soil Properties & Management Interpretations

Effective Rooting Depth	60 to 80 inches
Drainage	Well drained
Permeability	Moderately rapid
Available Water Capacity	
Upper 20 inches	1.8 to 2.1
Total	6.0 to 7.0
Hydrologic Soil Group	B
Unified Soil Classification	SM
Erosion Factor K	.24
Maximum Erosion Hazard	Moderate and high
Sensitivity	Low and moderate
Soil Manageability Class	3e
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	2 and 3
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of soils in the Shaver family in meadow areas, Holland and Chaix family soils on ridges, soils similar to the Chaix family but are darker in the Nelder Grove area, and soils in the Cannell family at upper elevations. Also included are soils in the Lower Chiquito Campground/Johnson Meadows area that have formed in glaciofluvial outwash material, that are more than 80 inches deep, and have either sandy loam or loamy sand substratums. Included areas make up about 25 percent of the map unit area. Much of this unit is in the Soquel Meadow/Nelder Grove area. The meadow and drainages in this unit (where alluvium has accumulated) are highly susceptible to gully erosion. The maximum erosion hazard for this soil is moderate on slopes of 5 to 15 percent and high on slopes of 15 to 45 percent. Sensitivity is low on 5 to 35 percent slopes and moderate on 35 to 45 percent slopes.

121 Chaix family - Chaix family, deep complex, 15 to 50 percent slopes

Elevation: 4,400 to 6,300 feet Annual Precipitation: 35 to 50 inches

Map Unit Components
Approximate Proportion
Landscape Position
Slope
Typical Vegetation Series

Chaix family

55 percent

Mountainsides and ridges

15 to 50 percent

Ponderosa Pine, Mixed Conifer-Pine

Chaix family, deep

30 percent

Mountainsides and ridges

15 to 50 percent

Mixed Conifer-Pine, Mixed Conifer-Fir

Soil Profile Description

Surface Layer

0 to 6 inches; grayish brown coarse sandy loam; moderate granular structure; slightly hard; pH 6.2

0 to 14 inches; pale brown sandy loam; weak subangular blocky structure parting to weak granular; soft; pH 6.0

Subsoil

6 to 36 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.0

14 to 54 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 5.8

Substratum

36 inches; highly weathered granodiorite

54 to 60 inches; very pale brown gravelly coarse sandy loam; massive; soft; 20 percent pebbles; pH 5.6

Soil Properties & Management Interpretations

Effective Rooting Depth

20" to 60"

60" to 80"

Drainage

Somewhat excessively drained

Well drained

Permeability

Moderately rapid

Moderately rapid

Available Water Capacity

Upper 20 inches

1.7 to 2.0

1.8 to 2.1

Total

1.7 to 6.6

6.0 to 7.0

Hydrologic Soil Group

B

B

Unified Soil Classification

SM

SM

Erosion Factor K

.24

.24

Maximum Erosion Hazard

High

High

Sensitivity

Moderate

Low and moderate

Soil Manageability Class

3e

3e

Annual Forage Production

Less than 200 lbs/acre

Less than 200 lbs/acre

Forest Survey Site Class

4

3

Manageability Group

III

III

Included Areas and Remarks:

Included in this unit are small areas of Rock outcrop, soils in the Shaver family in the Ross Creek/Fish Creek area and east of Mammoth Pool, soils similar to the Chaix family, deep in the Arnold Meadow area but are more than 80 inches deep, and soils in the Holland and Chawanakee families. Included areas make up about 15 percent of the map unit area. Most of the acreage of this unit is in the Minarets Work Center area. Regeneration is good on protected sites. Soils in the Chaix family, deep have sensitivity of low on 15 to 35 percent slopes and moderate on 35 to 50 percent slopes.

122 Chaix - Chawanakee families - Rock outcrop complex, 15 to 35 percent slopes

Elevation: 3,000 to 6,500 feet Annual Precipitation: 30 to 50 inches

Map Unit Components	Chaix family	Chawanakee family	Rock outcrop
Approximate Proportion	40 percent	35 percent	15 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges	Mountainsides and ridges
Slope	15 to 35 percent	15 to 35 percent	
Typical Vegetation Series	Ponderosa Pine	Black Oak/ Ponderosa Pine	

Soil Profile Description

Surface Layer	0 to 6 inches; grayish brown coarse sandy loam; moderate granular structure; slightly hard; pH 6.2	0 to 4 inches; grayish brown coarse sandy loam; weak granular structure; slightly hard; pH 6.2	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	6 to 36 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.0	4 to 19 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 5.8	
Substratum	36 inches; highly weathered granodiorite	19 inches; highly weathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 60 inches	12 to 20 inches
Drainage	Somewhat excessively drained	Somewhat excessively drained
Permeability	Moderately rapid	Moderately rapid
Available Water Capacity		
Upper 20 inches	1.7 to 2.0	0.9 to 2.0
Total	1.7 to 3.8	0.9 to 2.0
Hydrologic Soil Group	B	C
Unified Soil Classification	SM	SM
Erosion Factor K	.24	.20
Maximum Erosion Hazard	High	High
Sensitivity	Moderate	High
Soil Manageability Class	2ex	2edx
Annual Forage Production	200 to 600 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	4 and 5	6 and 7
Manageability Group	II	II

Included Areas and Remarks: Included in this unit are small areas of soils in the Holland family, and soils similar to the Chaix and Chawanakee families but have more than 35 percent rock fragments, loamy sand textures, or darker colors. Included areas make up about 10 percent of the map unit area. Soils in the Chaix family have fair artificial regeneration potential for ponderosa pine. Rock outcrop concentrates water on downslope soils which increases the erosion hazard of those soils when unprotected or disturbed. There are old beaver ponds in the Central Camp area.

123 Chaix - Chawanakee families - Rock outcrop complex, 35 to 65 percent slopes

Elevation: 3,000 to 6,700 feet Annual Precipitation: 30 to 50 inches

Map Unit Components	Chaix family	Chawanakee family	Rock Outcrop
Approximate Proportion	40 percent	35 percent	20 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges	Mountainsides and ridges
Slope	35 to 65 percent	35 to 65 percent	
Typical Vegetation Series	Ponderosa Pine	Black Oak/Ponderosa Pine	

Soil Profile Description

Surface Layer	0 to 6 inches; grayish brown coarse sandy loam; moderate granular structure; slightly hard; pH 6.2	0 to 4 inches; grayish brown coarse sandy loam; weak granular structure; slightly hard; pH 6.2	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	6 to 36 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.0	4 to 19 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 5.8	
Substratum	36 inches; highly weathered granodiorite	19 inches; highly weathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 40"	12" to 20"
Drainage	Somewhat excessively drained	Somewhat excessively drained
Permeability	Moderately rapid	Moderately rapid
Available Water Capacity		
Upper 20 inches	1.7 to 2.0	0.9 to 2.0
Total	1.7 to 3.7	0.9 to 2.0
Hydrologic Soil Group	B	C
Unified Soil Classification	SM	SM
Erosion Factor K	.24	.20
Maximum Erosion Hazard	High and very high	High and very high
Sensitivity	Moderate and high	High
Soil Manageability Class	3Ex	3Edx
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	5	6 and 7
Manageability Group	III	III
Included Areas and Remarks:	Included in this unit are small areas of soils similar to the Chaix and Chawanakee families but are on ridges with slopes of 15 to 35 percent, have more than 35 percent rock fragments, or loamy sand texture. Also included are soils similar to the Chawanakee family but are darker. Included areas make up about 5 percent of the map unit area. Soils in the Chaix and Chawanakee families have maximum erosion hazard of high on slopes of 35 to 50 percent and very high on slopes above 50 percent. Sensitivity of soils in the Chaix family is moderate on slopes less than 50 percent and high on slopes more than 50 percent.	

124 Chaix - Holland families complex, 15 to 35 percent slopes

Elevation: 3,600 to 5,800 feet Annual Precipitation: 45 to 55 inches

Map Unit Components	Chaix family	Holland family
Approximate Proportion	45 percent	40 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges
Slope	15 to 35 percent	15 to 35 percent
Typical Vegetation Series	Ponderosa Pine, Mixed Conifer-Pine	Ponderosa Pine, Mixed Conifer-Pine, Mixed Conifer-Fir

Soil Profile Description

Surface Layer	0 to 6 inches; grayish brown coarse sandy loam; moderate granular structure; slightly hard; pH 6.2	0 to 7 inches; brown sandy loam; strong granular structure; soft; pH 5.7
Subsoil	6 to 36 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.0	7 to 60 inches; brown sandy clay loam; strong subangular blocky structure; very hard; pH 5.8
Substratum	36 inches; highly weathered granodiorite	60 to 66 inches; very pale brown sandy loam; moderate subangular blocky structure; extremely hard; pH 5.6

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 60"	60" to 80"
Drainage	Somewhat excessively drained	Well drained
Permeability	Moderately rapid	Moderate
Available Water Capacity		
Upper 20 inches	1.7 to 2.0	3.0 to 3.4
Total	1.7 to 6.6	9.8 to 10.4
Hydrologic Soil Group	B	B
Unified Soil Classification	SM	SM/SC/SM-SC
Erosion Factor K	.24	.28
Maximum Erosion Hazard	High	High
Sensitivity	Moderate	Low
Soil Manageability Class	1e	1e
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	3 and 4	3
Manageability Group	I	I

Included Areas and Remarks: Included in this unit are small areas of Rock outcrop, soils in the Chaix family, deep, and soils similar to the Holland family but are less than 40 inches deep. Included areas make up about 15 percent of the map unit area. When wet, Holland family soils are slick and are susceptible to gullyng.

125 Chaix - Holland families complex, 35 to 65 percent slopes

Elevation: 3,600 to 5,800 feet Annual Precipitation: 45 to 55 inches

Map Unit Components	Chaix family	Holland family
Approximate Proportion	45 percent	40 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges
Slope	35 to 65 percent	35 to 65 percent
Typical Vegetation Series	Ponderosa Pine, Mixed Conifer-Pine	Ponderosa Pine, Mixed Conifer-Pine

Soil Profile Description

Surface Layer	0 to 6 inches; grayish brown coarse sandy loam; moderate granular structure; slightly hard; pH 6.2	0 to 7 inches; brown sandy loam; strong granular structure; soft; pH 5.7
Subsoil	6 to 36 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.0	7 to 60 inches; brown sandy clay loam; strong subangular blocky structure; very hard; pH 5.8
Substratum	36 inches; highly weathered granodiorite	60 to 66 inches; very pale brown sandy loam; moderate subangular blocky structure; extremely hard; pH 5.6

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 60"	60" to 80"
Drainage	Somewhat excessively drained	Well drained
Permeability	Moderately rapid	Moderate
Available Water Capacity		
Upper 20 inches	1.7 to 2.0	3.0 to 3.4
Total	1.7 to 6.6	9.8 to 10.4
Hydrologic Soil Group	B	B
Unified Soil Classification	SM	SM/SC/SM-SC
Erosion Factor K	.24	.28
Maximum Erosion Hazard	High and very high	High and very high
Sensitivity	Moderate and high	Moderate
Soil Manageability Class	3E	3E
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	3 and 4	3 and 4
Manageability Group	III	III

Included Areas and Remarks: Included in this unit are small areas of Rock outcrop, soils in the Chaix family, deep, soils similar to the Holland family but less than 40 inches deep, and soils in the Chawanakee family. Included areas make up about 15 percent of the map unit area. Road failures have occurred in this unit from cutbank slumps and washouts at stream crossings. The maximum erosion hazard for these soils is high on slopes of 35 to 50 percent and very high on slopes over 50 percent. Sensitivity of soils in the Chaix family is moderate on slopes less than 50 percent and high on slopes more than 50 percent.

126 Chawanakee family - Rock outcrop complex, 35 to 65 percent slopes

Elevation: 3,000 to 6,400 feet Annual Precipitation: 30 to 45 inches

Map Unit Components	Chawanakee family	Rock outcrop
Approximate Proportion	60 percent	30 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges
Slope	35 to 65 percent	
Typical Vegetation Series	Canyon Live Oak, Mariposa Manzanita, Black Oak/Ponderosa Pine	

Soil Profile Description

Surface Layer	0 to 4 inches; grayish brown coarse sandy loam; weak granular structure; slightly hard; pH 6.2	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	4 to 19 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 5.8	
Substratum	19 inches; highly weathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	12" to 20"	
Drainage	Somewhat excessively drained	
Permeability	Moderately rapid	
Available Water Capacity		
Upper 20 inches	0.9 to 2.0	
Total	0.9 to 2.0	
Hydrologic Soil Group	C	
Unified Soil Classification	SM	
Erosion Factor K	.20	
Maximum Erosion Hazard	High and very high	
Sensitivity	High	
Soil Manageability Class	4EXd	
Annual Forage Production	Less than 200 lbs/acre	
Forest Survey Site Class	6, 7 and NC	
Manageability Group	IV	
Included Areas and Remarks:	Included in this unit are small areas of soils in the Chaix family and soils similar to the Chawanakee family but are darker or are on slopes less than 35 percent. Included areas make up about 10 percent of the map unit area. This unit is steep with Rock outcrop and is not suited to producing commercial timber. Soils in the Chawanakee family have maximum erosion hazard of high on slopes of 35 to 50 percent and very high on slopes over 50 percent.	

127 Coarsegold - Auberry families association, 35 to 65 percent slopes

Elevation: 1,000 to 4,400 feet Annual Precipitation: 20 to 35 inches

Map Unit Components	Coarsegold family	Auberry family
Approximate Proportion	50 percent	35 percent
Landscape Position	Mountainsides, foothills, and ridges on metasedimentary rock	Mountainsides, foothills, and ridges on granitic rock
Slope	35 to 65 percent	35 to 65 percent
Typical Vegetation Series	Blue Oak, Interior Live Oak, Annual Grass-Forb	Blue Oak, Interior Live Oak, Annual Grass-Forb

Soil Profile Description

Surface Layer	0 to 4 inches; brown loam; weak subangular blocky structure parting to moderate granular; soft; pH 6.3	0 to 17 inches; brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.4
Subsoil	4 to 22 inches; brown gravelly clay loam; moderate angular blocky structure; very hard; 15 percent rock fragments; pH 6.7	17 to 29 inches; strong brown sandy clay loam; moderate subangular blocky structure; very hard; pH 5.7 29 to 62 inches; light yellowish brown coarse sandy loam; weak subangular blocky structure; very hard; pH 5.5
Substratum	22 inches; highly weathered metasedimentary rock	62 inches; weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 50"	30" to 80"
Drainage	Well drained	Well drained
Permeability	Moderate	Moderate
Available Water Capacity		
Upper 20 inches	2.8 to 3.2	1.7 to 2.1
Total	2.8 to 8.0	4.0 to 7.1
Hydrologic Soil Group	C	B
Unified Soil Classification	ML	SM/SC,SM
Erosion Factor K	.32	.24
Maximum Erosion Hazard	High and very high	High and very high
Sensitivity	Moderate and high	Moderate and high
Soil Manageability Class	3E	3E
Annual Forage Production	1,200 to 2,000 lbs/acre	600 to 1,200 lbs/acre
Forest Survey Site Class	NC	NC
Manageability Group	III	III
Included Areas and Remarks:	<p>Included in this unit are small areas of Rock outcrop, soils similar to Coarsegold family but are coarser-textured, darker, lighter, have more than 35 percent rock fragments, or are less than 20 inches deep. Also included are soils in the Ahwahnee family on granitic rock and soils similar to the Coarsegold and Auberry families but are on slopes less than 35 percent or more than 65 percent. Included areas make up about 15 percent of the map unit area. The maximum erosion hazard of these soils is high on slopes of 35 to 50 percent and very high on slopes over 50 percent. Sensitivity of these soils is moderate on slopes of 35 to 50 percent and high on slopes over 50 percent. Road cutbanks are somewhat unstable on slopes over 50 percent. On bare slopes these soils are susceptible to gully erosion. Small landslides are common in this map unit. Typically, the Interior Live Oak Vegetation Series is on northern aspects and the Annual Grass - Forb is on southern aspects. The majority of the acreage is in the southwest portion of the Kings River Ranger District.</p>	

128 Coarsegold - Auberry families - Rock outcrop association, 35 to 85 percent slopes

Elevation: 1,000 to 4,400 feet Annual Precipitation: 20 to 35 inches

Map Unit Components	Coarsegold family	Auberry family	Rock outcrop
Approximate Proportion	40 percent	30 percent	20 percent
Landscape Position	Mountainsides, foothills, and ridges on and ridges metasedimentary rock	Mountainsides, foothills, and ridges on granitic rock	Mountainsides, foothills, and ridges
Slope	35 to 85 percent	35 to 85 percent	
Typical Vegetation Series	Blue Oak, Interior Live Oak, Annual Grass-Forb	Blue Oak, Interior Live Oak, Annual Grass-Forb	

Soil Profile Description

Surface Layer	0 to 4 inches; brown loam; weak subangular blocky structure parting to moderate granular; soft; pH 6.3	0 to 17 inches; brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.4	Rock outcrop consists of isolated outcroppings and massive exposures of granitic and metamorphic rock
Subsoil	4 to 22 inches; brown gravelly clay loam; moderate angular blocky structure; very hard; 15 percent rock fragments; pH 6.7	17 to 29 inches; strong brown sandy clay loam; moderate subangular blocky structure; very hard; pH 5.7	
		29 to 62 inches; light yellowish brown coarse sandy loam; weak subangular blocky structure; very hard; pH 5.5	
Substratum	22 inches; highly weathered metasedimentary rock	62 inches; weathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 50"	30" to 80"
Drainage	Well drained	Well drained
Permeability	Moderate	Moderate
Available Water Capacity		
Upper 20 inches	2.8 to 3.2	1.7 to 2.1
Total	2.8 to 8.0	4.0 to 7.1
Hydrologic Soil Group	C	B
Unified Soil Classification	ML	SM/SC,SM
Erosion Factor K	.32	.24
Maximum Erosion Hazard	High and very high	High and very high
Sensitivity	Moderate and high	Moderate and high
Soil Manageability Class	4Ex	4Ex
Annual Forage Production	600 to 1,200 lbs/acre	600 to 1,200 lbs/acre
Forest Survey Site Class	NC	NC
Manageability Group	IV	IV

**Included Areas and
Remarks:**

Included in this unit are small areas of soils similar to the Auberry and Coarsegold families but are darker and on 35 to 50 percent slopes, and soils that are less than 20 inches deep on 45 to 85 percent slopes. Included areas make up about 10 percent of the map unit area. The maximum erosion hazard of these soils is high on slopes of 35 to 50 percent and very high on slopes over 50 percent. The sensitivity of these soils is moderate on slopes of 35 to 50 percent and high on slopes over 50 percent. Small landslides are common in this map unit. Typically, the Interior Live Oak Vegetation Series is on northern aspects and the Annual Grass - Forb is on southern aspects. Most of this unit is in the southern portion of the Kings River Ranger District.

129 Delpiedra family - Rock outcrop complex, 30 to 60 percent slopes

Elevation: 1,000 to 3,200 feet Annual Precipitation: 20 to 25 inches

Map Unit Components	Delpiedra family	Rock outcrop
Approximate Proportion	60 percent	20 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 60 percent	
Typical Vegetation Series	Annual Grass-Forb	

Soil Profile Description

Surface Layer	0 to 4 inches; reddish brown gravelly loam; weak subangular blocky structure; hard; 20 percent pebbles; pH 6.9	Rock outcrop consists of isolated outcroppings of remetamorphosed serpentine
Subsoil	4 to 12 inches; yellowish red gravelly loam; strong subangular blocky structure; hard; 30 percent pebbles; pH 7.0	
Substratum	12 inches; weathered, fractured remetamorphosed serpentine	

Soil Properties & Management Interpretations

Effective Rooting Depth	10" to 20"
Drainage	Well drained and somewhat excessively drained
Permeability	Moderate
Available Water Capacity	
Upper 20 inches	1.3 to 2.8
Total	1.3 to 2.8
Hydrologic Soil Group	D
Unified Soil Classification	SM-SC
Erosion Factor K	.28
Maximum Erosion Hazard	High
Sensitivity	High
Soil Manageability Class	3Xed
Annual Forage Production	1,200 to 2,000 lbs/acre
Forest Survey Site Class	NC
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of soils similar to the Delpiedra family but are 20 to 40 inches deep, finer-textured, or on hard bedrock. Also included are soils 20 to 40 inches deep on basic igneous rock. Included areas make up about 20 percent of the map unit area. This unit is 690 acres in size and occurs in one delineation adjacent to Pine Flat Reservoir. Small landslides are common on this map unit.

130 Dystric Lithic Xerochrepts - Ultic Haploxeralfs - Rock outcrop association, 50 to 80 percent slopes

Elevation: 1,700 to 5,600 feet Annual Precipitation: 35 to 45 inches

Map Unit Components	Dystric Lithic Xerochrepts	Ultic Haploxeralfs	Rock outcrop
Approximate Proportion	55 percent	20 percent	15 percent
Landscape Position	Mountainsides	Mountainsides: mainly on midslopes and lower, and away from Rock outcrop	Mountainsides
Slope	50 to 80 percent	50 to 65 percent	
Typical Vegetation Series	Mariposa Manzanita, Annual Grass-Forb	Mariposa Manzanita, Annual Grass-Forb	

Soil Profile Description

Surface Layer	0 to 7 inches; yellowish red cobbly loam; weak granular structure; slightly hard; 15 percent rock fragments; pH 6.5	0 to 3 inches; light yellowish brown gravelly loam; weak granular structure; soft; 15 percent pebbles; pH 7.0	Rock outcrop consists of isolated outcroppings and massive exposures of metasedimentary rock
Subsoil	7 to 11 inches; reddish yellow very cobbly loam; weak subangular blocky structure; slightly hard; 35 percent cobbles; pH 6.2	3 to 32 inches; reddish yellow silt loam; weak subangular blocky structure; hard; pH 6.0	
Substratum	11 inches; hard, fractured weakly metamorphosed sandstone	32 inches; highly weathered weakly metamorphosed slate	

Soil Properties & Management Interpretations

Effective Rooting Depth	10" to 20"	20" to 40"
Drainage	Somewhat excessively drained	Well drained
Permeability	Moderately rapid	Moderate
Available Water Capacity		
Upper 20 inches	1.3 to 2.9	2.4 to 2.6
Total	1.3 to 2.9	2.4 to 5.4
Hydrologic Soil Group	D	C
Unified Soil Classification	SM	SM/CL-ML
Erosion Factor K	.28	.28
Maximum Erosion Hazard	Very high	Very high
Sensitivity	High	High
Soil Manageability Class	4Edx	4Ex
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	NC	NC
Manageability Group	IV	IV
Included Areas and Remarks:	Included in this unit are small areas of soils similar to Ultic Haploxeralfs but are less than 20 inches deep, and soils similar to Ultic Haploxeralfs and Dystric Lithic Xerochrepts but are warmer below 2,700 feet. Included areas make up about 10 percent of the map unit area. Most of this unit is in the South Fork Merced River drainage area. Its accessibility is limited except for a few hiking and four-wheel drive trails. Small landslides are common in this map unit.	

131 Dystric Xerochrepts and Typic Xerumbrepts, 20 to 50 percent slopes

Elevation: 6,700 to 8,800 feet Annual Precipitation: 30 to 55 inches

Map Unit Components	Dystric Xerochrepts	Typic Xerumbrepts
Approximate Proportion	45 percent	25 percent
Landscape Position	Mountainsides, colluvial slopes and volcanic flows, mainly in the Pincushion Peak area	Mountainsides, colluvial slopes and volcanic flows, mainly in the Graveyard Meadow area
Slope	20 to 50 percent	20 to 50 percent
Typical Vegetation Series	Red Fir	Red Fir

Soil Profile Description

Surface Layer	0 to 18 inches; brown cobbly coarse sandy loam; weak granular structure; soft; 20 percent rock fragments; pH 5.5	0 to 15 inches; very dark grayish brown loam; moderate granular structure; soft; pH 6.5
Subsoil	18 to 32 inches; brown cobbly coarse sandy loam; weak subangular blocky structure; slightly hard; 20 percent rock fragments; pH 5.5	15 to 35 inches; strong brown gravelly sandy loam; weak subangular blocky structure; soft; 30 percent rock fragments; pH 6.2
Substratum	32 inches; highly weathered basalt	35 to 60 inches; light weathered yellowish brown extremely gravelly loamy sand; massive; soft; 65 percent rock fragments; pH 6.3

Soil Properties & Management Interpretations

Effective Rooting Depth	22" to 54"	40" to 70"
Drainage	Well drained and somewhat excessively drained	Well drained
Permeability	Moderately rapid	Moderately rapid
Available Water Capacity		
Upper 20 inches	1.1 to 1.5	2.0 to 2.4
Total	1.4 to 5.0	3.7 to 5.0
Hydrologic Soil Group	B	B
Unified Soil Classification	SM	SM/SM/GW-GM
Erosion Factor K	.24	.20
Maximum Erosion Hazard	Moderate and high	Moderate
Sensitivity	Moderate	Low
Soil Manageability Class	3e	3
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	4 and 5	4
Manageability Group	III	III

Included Areas and Remarks: Included in this unit are small areas of Ultic Haploxeralfs, deep on 15 to 35 percent slopes, soils in the Umpa family, deep on colluvial slopes, and Rock outcrop on ridges and the uppermost slopes. Also included are soils in the Cagwin family and Lithic Xeropsamments at the edges of the mapping unit delineations where the underlying granitic bedrock is exposed. Included areas make up about 30 percent of the map unit area. Dystric Xerochrepts have a maximum erosion hazard of moderate on slopes of 20 to 35 percent and high on slopes of 35 to 50 percent. The soils in this unit are highly variable because of the influence of several types of geologic processes, landscape positions, and parent materials.

132 Entic Cryumbrepts, 5 to 50 percent slopes

Elevation: 9,100 to 10,600 feet Annual Precipitation: 35 to 40 inches

Map Unit Components	Entic Cryumbrepts
Approximate Proportion	80 percent
Landscape Position	Broad ridges and mountainsides, mostly unglaciated
Slope	5 to 50 percent
Typical Vegetation Series	Lodgepole Pine, Western White Pine

Soil Profile Description

Surface Layer	0 to 14 inches; grayish brown gravelly loamy coarse sand; weak granular structure; soft; 25 percent pebbles; pH 5.2
Subsoil	14 to 22 inches; light yellowish brown very stony loamy coarse sand; single grain; loose; 60 percent rock fragments; pH 5.3
Substratum	22 inches; highly fractured granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	20" to 40"
Drainage	Somewhat excessively drained and excessively drained
Permeability	Moderately rapid and rapid
Available Water Capacity	
Upper 20 inches	0.9 to 2.3
Total	0.9 to 3.8
Hydrologic Soil Group	A
Unified Soil Classification	SW-SM/GW-GM
Erosion Factor K	.20
Maximum Erosion Hazard	Moderate and high
Sensitivity	High
Soil Manageability Class	3e
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	NC
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop and Cryorthents. Included areas make up about 20 percent of the map unit area. Entic Cryumbrepts have a maximum erosion hazard of moderate on slopes under 35 percent and high on slopes over 35 percent. This unit is relatively small (2,210 acres). It occurs mainly in the Mt. Givens area. Most of this unit has not been glaciated.

133 Entic Cryumbrepts - Rock outcrop complex, 15 to 55 percent slopes

Elevation: 8,300 to 10,600 feet Annual Precipitation: 35 to 50 inches

Map Unit Components
Approximate Proportion
Landscape Position
Slope
Typical Vegetation Series

Entic Cryumbrepts

Rock outcrop

55 percent

30 percent

Mountainsides and broad ridges

Mountainsides and ridges

15 to 55 percent

Lodgepole Pine, Western White Pine

Soil Profile Description

Surface Layer

0 to 14 inches; grayish brown gravelly loamy coarse sand; weak granular structure; soft; 25 percent pebbles; pH 5.2

Subsoil

14 to 22 inches; light yellowish brown very stony loamy coarse sand; single grain; loose; 60 percent rock fragments; pH 5.3

Substratum

22 inches; highly fractured granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth

20" to 40"

Drainage

Somewhat excessively drained and excessively drained

Permeability

Moderately rapid and rapid

Available Water Capacity

Upper 20 inches

0.9 to 2.3

Total

0.9 to 3.8

Hydrologic Soil Group

A

Unified Soil Classification

SW-SM/GW-GM

Erosion Factor K

.20

Maximum Erosion Hazard

Moderate and high

Sensitivity

High

Soil Manageability Class

3Xe

Annual Forage Production

Less than 200 lbs/acre

Forest Survey Site Class

NC

Manageability Group

III

Included Areas and Remarks:

Included in this unit are small areas of soils in the Stecum family, Cryorthents, and soils similar to Entic Cryumbrepts but are on slopes over 55 percent. Included areas make up about 15 percent of the map unit area. Entic Cryumbrepts have a maximum erosion hazard of moderate on slopes under 35 percent and high on slopes over 35 percent. Rock outcrop concentrates water on downslope soils which increases the erosion hazard of those soils.

134 Gerle - Cagwin families association, 5 to 35 percent slopes

Elevation: 6,200 to 8,400 feet Annual Precipitation: 40 to 55 inches

Map Unit Components
Approximate Proportion
Landscape Position
Slope
Typical Vegetation Series

Gerle family

65 percent
Mountainsides
5 to 35 percent
Red Fir

Cagwin family

20 percent
Ridges
5 to 35 percent
Mixed Conifer-Fir

Soil Profile Description

Surface Layer

0 to 14 inches; brown gravelly coarse sandy loam, weak granular structure; soft; 15 percent rock fragments; pH 5.8

0 to 5 inches; dark gray loamy coarse sand; single grain; loose; pH 5.4

Subsoil

14 to 26 inches; light yellowish brown cobbly coarse sandy loam; weak subangular blocky structure; soft; 20 percent rock fragments; pH 5.5

5 to 32 inches; very pale brown gravelly loamy coarse sand; single grain; soft; 15 percent pebbles; pH 5.5

Substratum

26 to 38 inches; pale brown cobbly loamy coarse sand; massive; loose; 20 percent rock fragments; pH 5.2

38 inches; highly weathered granodiorite

32 inches; highly weathered granitic rock

Soil Properties & Management Interpretations

Effective Rooting Depth

30" to 50"

20" to 40"

Drainage

Well drained

Somewhat excessively drained

Permeability

Moderately rapid

Rapid

Available Water Capacity

Upper 20 inches

1.6 to 2.0

1.1 to 1.4

Total

3.0 to 4.6

1.1 to 2.5

Hydrologic Soil Group

B

A

Unified Soil Classification

SM

SM

Erosion Factor K

.20

.17

Maximum Erosion Hazard

Moderate

Moderate

Sensitivity

Low

Moderate

Soil Manageability Class

1

1

Annual Forage Production

200 to 600 lbs/acre

Less than 200 lbs/acre

Forest Survey Site Class

3

5

Manageability Group

I

I

Included Areas and Remarks:

Included in this unit are small areas of Rock outcrop, soils in the Cannell family, wet meadows, and soils in the Shaver family at lower elevations. Included areas make up about 15 percent of the map unit area.

135 Gerle - Cagwin families association, 35 to 55 percent slopes

Elevation: 6,000 to 8,400 feet Annual Precipitation: 40 to 55 inches

Map Unit Components
Approximate Proportion
Landscape Position
Slope
Typical Vegetation Series

Gerle family

50 percent
Mountainsides: concave slopes

35 to 55 percent

Red Fir

Cagwin family

30 percent
Mountainsides and ridges: convex south-to-west-facing slopes on more resistant rock

35 to 55 percent

Mixed Conifer-Fir

Soil Profile Description

Surface Layer

0 to 14 inches; brown gravelly coarse sandy loam, weak granular structure; soft; 15 percent rock fragments; pH 5.8

0 to 5 inches; dark gray loamy coarse sand; single grain; loose; pH 5.4

Subsoil

14 to 26 inches; light yellowish brown cobbly coarse sandy loam; weak subangular blocky structure; soft; 20 percent rock fragments; pH 5.5

5 to 32 inches; very pale brown gravelly loamy coarse sand; single grain; soft; 15 percent pebbles; pH 5.5

26 to 38 inches; pale brown cobbly loamy coarse sand; massive; loose; 20 percent rock fragments; pH 5.2

Substratum

38 inches; highly weathered granodiorite

32 inches; highly weathered granitic rock

Soil Properties & Management Interpretations

Effective Rooting Depth

30" to 50"

20" to 40"

Drainage

Well drained

Somewhat excessively drained

Permeability

Moderately rapid

Rapid

Available Water Capacity

Upper 20 inches

1.6 to 2.0

1.1 to 1.4

Total

3.0 to 4.6

1.1 to 2.5

Hydrologic Soil Group

B

A

Unified Soil Classification

SM

SM

Erosion Factor K

.20

.17

Maximum Erosion Hazard

Moderate

High

Sensitivity

Moderate

High

Soil Manageability Class

3

3e

Annual Forage Production

200 to 600 lbs/acre

Less than 200 lbs/acre

Forest Survey Site Class

3

5

Manageability Group

III

III

Included Areas and Remarks:

Included in this unit are small areas of Rock outcrop and soils in the Cannell family. Included areas make up about 20 percent of the map unit area. Most of this unit occurs in the north-central part of the Kings River Ranger District.

136 Holland family, 5 to 35 percent slopes

Elevation: 3,600 to 5,800 feet Annual Precipitation: 30 to 50 inches

Map Unit Components	Holland family
Approximate Proportion	90 percent
Landscape Position	Mountainsides and broad ridges
Slope	5 to 35 percent
Typical Vegetation Series	Ponderosa Pine, Mixed Conifer-Pine

Soil Profile Description

Surface Layer	0 to 7 inches; brown sandy loam; strong granular structure; soft; pH 5.7
Subsoil	7 to 60 inches; brown sandy clay loam; strong subangular blocky structure; very hard; pH 5.8
Substratum	60 to 66 inches; very pale brown sandy loam; moderate subangular blocky structure; extremely hard; pH 5.6

Soil Properties & Management Interpretations

Effective Rooting Depth	60" to 80"
Drainage	Well drained
Permeability	Moderate and moderately slow
Available Water Capacity	
Upper 20 inches	3.0 to 3.4
Total	9.8 to 10.4
Hydrologic Soil Group	B
Unified Soil Classification	SM/SC/SM-SC
Erosion Factor K	.28
Maximum Erosion Hazard	Moderate and high
Sensitivity	Low
Soil Manageability Class	1e
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	3
Manageability Group	I
Included Areas and Remarks:	Included in this unit are small areas of soils similar to the Holland family but are finer-textured, and soils in the Chaix family on ridges and along drainages. Also included are dark alluvial soils which are being cultivated in the Jerseydale area. Included areas make up about 10 percent of map unit area. The maximum erosion hazard for this soil is moderate on 5 to 15 percent slopes and high on 15 to 35 percent slopes. The potential for gully erosion on this soil is high. Holland family soils are susceptible to compaction when moist or wet. Bear Clover forms a thick cover over this soil. Roads and skid trails built on Holland family soils are highly susceptible to gully erosion without adequate drainage and when rutted.

137 Holland family, 35 to 65 percent slopes

Elevation: 3,500 to 5,800 feet Annual Precipitation: 30 to 50 inches

Map Unit Components	Holland family
Approximate Proportion	85 percent
Landscape Position	Mountainsides
Slope	35 to 65 percent
Typical Vegetation Series	Ponderosa Pine, Mixed Conifer-Pine

Soil Profile Description

Surface Layer	0 to 7 inches; brown sandy loam; strong granular structure; soft; pH 5.7
Subsoil	7 to 60 inches; brown sandy clay loam; strong subangular blocky structure; very hard; pH 5.8
Substratum	60 to 66 inches; very pale brown sandy loam; moderate subangular blocky structure; extremely hard; pH 5.6

Soil Properties & Management Interpretations

Effective Rooting Depth	60" to 80"
Drainage	Well drained
Permeability	Moderate and moderately slow
Available Water Capacity	
Upper 20 inches	3.0 to 3.4
Total	9.8 to 10.4
Hydrologic Soil Group	B
Unified Soil Classification	SM/SC/SM-SC
Erosion Factor K	.28
Maximum Erosion Hazard	High and very high
Sensitivity	Moderate
Soil Manageability Class	3E
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	3
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of soils in the Chaix and Chawanakee families, and Rock outcrop on convex southeast- to southwest-facing slopes of 45 to 65 percent. Also included are soils in the Shaver family along drainages, and soils similar to the Holland family but have finer-textured subsoils or are 30 to 60 inches deep. Included areas make up about 15 percent of the map unit area. The maximum erosion hazard for this soil is high on slopes of 35 to 50 percent and very high on slopes over 50 percent. There is a high potential for cutbank failure on roads built in this unit. The roadbed is highly susceptible to gully erosion when it is not surfaced, carries excess water from other sources, or is rutted. Also, Holland family soils are susceptible to compaction when moist or wet. Bear Clover forms a thick cover over this soil also.

138 Holland - Chaix families complex, 5 to 35 percent slopes

Elevation: 2,700 to 5,500 feet Annual Precipitation: 30 to 40 inches

Map Unit Components	Holland family	Chaix family
Approximate Proportion	65 percent	20 percent
Landscape Position	Mountainsides and broad ridges	Mountainsides and broad ridges
Slope	5 to 35 percent	5 to 35 percent
Typical Vegetation Series	Ponderosa Pine	Ponderosa Pine, Mariposa Manzanita/Ponderosa Pine

Soil Profile Description

	Holland family	Chaix family
Surface Layer	0 to 7 inches; brown sandy loam; strong granular structure; soft; pH 5.7	0 to 6 inches; grayish brown coarse sandy loam; moderate granular structure; slightly hard; pH 6.2
Subsoil	7 to 60 inches; brown sandy clay loam; strong subangular blocky structure; very hard; pH 5.8	6 to 36 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.0
Substratum	60 to 66 inches; very pale brown sandy loam; moderate subangular blocky structure; extremely hard; pH 5.6	36 inches; highly weathered granodiorite

Soil Properties & Management Interpretations

	Holland family	Chaix family
Effective Rooting Depth	60 to 80 inches	20 to 40 inches
Drainage	Well drained	Somewhat excessively drained
Permeability	Moderate and moderately slow	Moderately rapid
Available Water Capacity		
Upper 20 inches	3.0 to 3.4	1.7 to 2.0
Total	9.8 to 10.4	1.7 to 3.8
Hydrologic Soil Group	B	B
Unified Soil Classification	SM/SC/SM-SC	SM
Erosion Factor K	.28	.24
Maximum Erosion Hazard	Moderate and high	Moderate and high
Sensitivity	Low	Moderate
Soil Manageability Class	1e	1e
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	4	5
Manageability Group	I	I

Included Areas and Remarks:

Included in this unit are small areas of Rock outcrop, soils similar to the Holland family but are 30 to 60 inches deep, soils in the Auberry and Ahwahnee families along the Forest Boundary, soils in the Chawanakee family, and soils in the Chaix family, deep in the Rancheria Creek area. Included areas make up about 15 percent of the map unit area. These soils have a maximum erosion hazard of moderate on slopes of 5 to 15 percent and high on slopes of 15 to 35 percent. There are many private homes in this unit. It is moderately difficult to regenerate because of warm temperatures and low precipitation. Roads are highly susceptible to gully erosion (when unsurfaced) and cutbank failure.

139 Holland - Chaix families complex, 35 to 65 percent slopes

Elevation: 2,700 to 4,800 feet Annual Precipitation: 25 to 40 inches

Map Unit Components	Holland family	Chaix family
Approximate Proportion	60 percent	20 percent
Landscape Position	South-to west-facing mountainsides and ridges	South-to west-facing mountainsides and ridges
Slope	35 to 65 percent	35 to 65 percent
Typical Vegetation Series	Ponderosa Pine	Ponderosa Pine, Mariposa Manzanita/Ponderosa Pine

Soil Profile Description

Surface Layer	0 to 7 inches; brown sandy loam; strong granular structure; soft; pH 5.7	0 to 6 inches; grayish brown coarse sandy loam; moderate granular structure; slightly hard; pH 6.2
Subsoil	7 to 60 inches; brown sandy clay loam; strong subangular blocky structure; very hard; pH 5.8	6 to 36 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 6.0
Substratum	60 to 66 inches; very pale brown sandy loam; moderate subangular blocky structure; extremely hard; pH 5.6	36 inches; highly weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	60" to 80"	20" to 40"
Drainage	Well drained	Somewhat excessively drained
Permeability	Moderate and moderately slow	Moderately rapid
Available Water Capacity		
Upper 20 inches	3.0 to 3.4	1.7 to 2.0
Total	9.8 to 10.4	1.7 to 3.8
Hydrologic Soil Group	B	B
Unified Soil Classification	SM/SC/SM-SC	SM
Erosion Factor K	.28	.24
Maximum Erosion Hazard	High and very high	High and very high
Sensitivity	Moderate	Moderate and high
Soil Manageability Class	3E	3E
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	4	5
Manageability Group	III	III
Included Areas and Remarks:	<p>Included in this unit are small areas of Rock outcrop, soils similar to the Holland family but are 30 to 60 inches deep, soils in the Chawanakee and Tollhouse families, and soils similar to the Chaix family but are darker. Included areas make up about 20 percent of the map unit area. These soils have a maximum erosion hazard of high on slopes of 35 to 50 percent and very high on slopes over 50 percent. Sensitivity of soils in the Chaix family is moderate on slopes of 35 to 50 percent and high on slopes over 50 percent. The soils in this unit have been eroded from past activities and fires. Regeneration is moderately difficult because of the erosion and warm temperatures. Failures on road cutbanks and road gully erosion is high on the soils in the Holland family.</p>	

140 Holland - Chawanakee families complex, 35 to 65 percent slopes

Elevation: 3,000 to 5,400 feet Annual Precipitation: 30 to 45 inches

Map Unit Components	Holland family	Chawanakee family
Approximate Proportion	50 percent	35 percent
Landscape Position	Mountainsides and broad ridges	Mountainsides and sharp ridges on resistant rock
Slope	35 to 65 percent	35 to 65 percent
Typical Vegetation Series	Ponderosa Pine	Mariposa Manzanita/Ponderosa Pine

Soil Profile Description

Surface Layer	0 to 7 inches; brown sandy loam; strong granular structure; soft; pH 5.7	0 to 4 inches; grayish brown coarse sandy loam; weak granular structure; slightly hard; pH 6.2
Subsoil	7 to 60 inches; brown sandy clay loam; strong subangular blocky structure; very hard; pH 5.8	4 to 19 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 5.8
Substratum	60 to 66 inches; very pale brown sandy loam; Moderate subangular blocky structure; extremely hard; pH 5.6	19 inches; highly weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	60" to 80"	12" to 20"
Drainage	Well drained	Somewhat excessively drained
Permeability	Moderate and Moderately Slow	Moderately Rapid
Available Water Capacity		
Upper 20 inches	3.0 to 3.4	0.9 to 2.0
Total	9.8 to 10.4	0.9 to 2.0
Hydrologic Soil Group	B	C
Unified Soil Classification	SM/SC/SM-SC	SM
Erosion Factor K	.28	.20
Maximum Erosion Hazard	High and very high	High and very high
Sensitivity	Moderate	High
Soil Manageability Class	3E	3Ed
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	4	6 and 7
Manageability Group	III	III
Included Areas and Remarks:	<p>Included in this unit are small areas of Rock outcrop, soils in the Chaix family, and soils similar to the Chawanakee family but are darker. Also included are soils in the Fence Meadow area on metamorphic rock that are similar to the Holland family but are finer-textured, 30 to 60 inches deep, or have more than 35 percent rock fragments. Included areas make up about 15 percent of the map unit area. These soils have a maximum erosion hazard of high on slopes of 35 to 50 percent and very high on slopes over 50 percent. Holland family soils have high compaction and gully erosion hazard potentials. Chawanakee family soils are very difficult to artificially regenerate and build roads in.</p>	

141 Holland - Chawanakee families - Rock outcrop complex, 15 to 35 percent slopes

Elevation: 3,000 to 6,000 feet Annual Precipitation: 30 to 45 inches

Map Unit Components	Holland family	Chawanakee family	Rock Outcrop
Approximate Proportion	45 percent	30 percent	15 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges over resistant rocks	Mountainsides and ridges
Slope	15 to 35 percent	15 to 35 percent	
Typical Vegetation Series	Ponderosa Pine	Mariposa Manzanita/Ponderosa Pine	

Soil Profile Description

Surface Layer	0 to 7 inches; brown sandy loam; strong granular structure; soft; pH 5.7	0 to 4 inches; grayish brown coarse sandy loam; weak granular structure; slightly hard; pH 6.2
Subsoil	7 to 60 inches; brown sandy clay loam; strong subangular blocky structure; very hard; pH 5.8	4 to 19 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 5.8
Substratum	60 to 66 inches; very pale brown sandy loam; moderate subangular blocky structure; extremely hard; pH 5.6	19 inches; highly weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	60" to 80"	12" to 20"
Drainage	Well drained	Somewhat excessively drained
Permeability	Moderate and moderately slow	Moderately rapid
Available Water Capacity		
Upper 20 inches	3.0 to 3.4	0.9 to 2.0
Total	9.8 to 10.4	0.9 to 2.0
Hydrologic Soil Group	B	C
Unified Soil Classification	SM/SC/SM-SC	SM
Erosion Factor K	.28	.20
Maximum Erosion Hazard	High	High
Sensitivity	Low	High
Soil Manageability Class	1e	2edx
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	4	6 and 7
Manageability Group	I	I
Included Areas and Remarks:	Included in this unit are small areas of Rock outcrop soils in the Chaix family, soils similar to the Chawanakee family but are darker, and soils similar to the Chaix family but are darker in the Westfall Station area. Included areas make up about 20 percent of the map unit area. Holland family soils have high compaction and gully erosion hazard potentials. Chawanakee family soils are very difficult to artificially regenerate and build roads in.	

142 Holland - Neuns families association, 15 to 45 percent slopes

Elevation: 3,000 to 4,400 feet Annual Precipitation: 35 to 45 inches

Map Unit Components	Holland family	Neuns family
Approximate Proportion	50 percent	35 percent
Landscape Position	Mountainsides: mainly midslopes and toeslopes	Mountainsides: mainly mid-to upperslopes, and ridges
Slope	15 to 45 percent	15 to 45 percent
Typical Vegetation Series	Ponderosa Pine	Ponderosa Pine, Mariposa Manzanita/Ponderosa Pine

Soil Profile Description

Surface Layer	0 to 9 inches; yellowish red loam; weak granular structure; soft; pH 6.5	0 to 6 inches; brown loam; weak granular structure; soft; pH 7.8
Subsoil	9 to 66 inches; red clay loam; weak angular blocky structure; very hard; pH 7.0	6 to 21 inches; reddish yellow very cobbly loam; weak subangular blocky structure; soft; 50 percent rock fragments; pH 7.0
Substratum		21 inches; highly fractured weakly metamorphosed slate

Soil Properties & Management Interpretations

Effective Rooting Depth	60" to 80"	20" to 40"
Drainage	Well drained	Well drained
Permeability	Moderate	Moderately rapid
Available Water Capacity		
Upper 20 inches	2.2 to 2.6	2.1 to 2.5
Total	9.0 to 10.0	2.1 to 5.1
Hydrologic Soil Group	B	B
Unified Soil Classification	ML/CL-ML	SM/GM
Erosion Factor K	.28	.24
Maximum Erosion Hazard	High	Moderate and high
Sensitivity	Low and moderate	Moderate
Soil Manageability Class	3e	3e
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	3 and 4	4 and 5
Manageability Group	III	III

Included Areas and Remarks: Included in this unit are small areas of Dystric Lithic Xerochrepts and Ultic Haploxeralfs. Included areas make up about 15 percent of the map unit area. This unit is on metamorphic rock. Roads on Holland family soils are very slick when wet. Soils in the Neuns family have a maximum erosion hazard of moderate on slopes of 15 to 35 percent and high on slopes over 35 percent. Sensitivity of soils in the Holland family is low on slopes of 15 to 35 percent and moderate on slopes of 35 to 45 percent. Competition from Mariposa manzanita is high on Neuns family soils on south-facing slopes. Neuns family soils can be difficult to plant due to rock fragment content. The majority of this unit is on the Mariposa Ranger District.

143 Ledford family - Entic Xerumbrepts - Rock outcrop association, 10 to 45 percent slopes

Elevation: 6,000 to 7,600 feet Annual Precipitation: 40 to 60 inches

Map Unit Components	Ledford family	Entic Xerumbrepts	Rock outcrop
Approximate Proportion	50 percent	20 percent	15 percent
Landscape Position	Mountainsides	Mountainsides and ridges, east-to ridges west-facing convex slopes, frequently adjacent to Rock outcrop	Mountainsides and ridges
Slope	10 to 35 percent	10 to 45 percent	
Typical Vegetation Series	Red Fir, Mixed Conifer-Fir	Mixed Conifer-Fir Jeffrey Pine	

Soil Profile Description

Surface Layer	0 to 8 inches; dark grayish brown coarse sandy loam; moderate granular structure; soft; pH 5.8	0 to 8 inches; very dark grayish brown sandy loam; weak granular structure; soft; pH 6.2	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock
Subsoil	8 to 18 inches; brown coarse sandy loam; massive; soft; pH 5.6	8 to 12 inches; yellowish brown gravelly coarse sandy loam; massive; slightly hard; 15 percent pebbles; pH 5.8	
		12 to 18 inches; light gray gravelly loamy coarse sand; massive; slightly hard; 30 percent pebbles; pH 5.8	
Substratum	18 to 60 inches; pale brown gravelly coarse sandy loam; massive; soft; 15 percent pebbles; pH 5.4	18 inches; highly weathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	40" to 80"	10" to 20"
Drainage	Somewhat excessively drained	Somewhat excessively drained
Permeability	Moderately rapid	Moderately rapid
Available Water Capacity		
Upper 20 inches	1.8 to 2.2	0.9 to 1.6
Total	4.2 to 6.2	0.9 to 1.6
Hydrologic Soil Group	B	C
Unified Soil Classification	SM	SM/SM,SW
Erosion Factor K	.20	.20
Maximum Erosion Hazard	Moderate	Moderate and high
Sensitivity	Low	High
Soil Manageability Class	1	3ed
Annual Forage Production	Less than 200 lbs/acre	Less than 200 lbs/acre
Forest Survey Site Class	4	5 and 6
Manageability Group	I	I

**Included Areas and
Remarks:**

Included in this unit are small areas of Aquic Dystric Xerochrepts in low drainage areas, and soils similar to the Ledford family but have loamy sand textures throughout or have a thicker surface horizon. Also included are soils similar to Entic Xerumbrepts, but are lighter in color or have loamy sand textures throughout or are on hard slightly weathered bedrock. Included areas make up about 15 percent of the map unit area. Competition from mountain whitethorn is very high on Entic Xerumbrepts in plantations. Entic Xerumbrepts have a maximum erosion hazard of moderate on slopes of 10 to 35 percent and high on slopes over 35 percent. Rock outcrop concentrates water on downslope soils which increases the erosion hazard of those soils.

144 Lithic Xeropsamments - Rock outcrop association, 5 to 40 percent slopes

Elevation: 6,200 to 8,400 feet Annual Precipitation: 25 to 60 inches

Map Unit Components	Lithic Xeropsamments	Rock outcrop
Approximate Proportion	45 percent	35 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges
Slope	5 to 40 percent	
Typical Vegetation Series	Greenleaf Manzanita/Jeffrey Pine	

Soil Profile Description

Surface Layer	0 to 11 inches; brown gravelly loamy coarse sand; single grain; loose; 15 percent pebbles; pH 5.6	Rock outcrop consists of massive exposures of granite bedrock
Subsoil		
Substratum	11 inches; unweathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	4" to 20"
Drainage	Excessively drained
Permeability	Rapid
Available Water Capacity	
Upper 20 inches	0.3 to 1.5
Total	0.3 to 1.5
Hydrologic Soil Group	D
Unified Soil Classification	SW-SM
Erosion Factor K	.17
Maximum Erosion Hazard	Moderate and high
Sensitivity	High
Soil Manageability Class	4DXe
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	6 and 7
Manageability Group	IV

Included Areas and Remarks: Included in this unit are small areas of soils in the Cagwin family, soils similar to Lithic Xeropsamments but have more than 35 percent rock fragments and/or are on highly weathered bedrock. Also included are isolated remnants of soils in the Sirretta family. Included areas make up about 20 percent of the map unit area. The artificial regeneration potential and plantability of this soil is very poor. Lithic Xeropsamments have a maximum erosion hazard of moderate on slopes of 5 to 15 percent and high on slopes of 15 to 50 percent. Rock outcrop concentrates large quantities of water on downslope soils which increases the erosion hazard of those soils.

145 Lithic Xeropsamments - Rock outcrop association, 40 to 65 percent slopes

Elevation: 6,200 to 8,400 feet Annual Precipitation: 25 to 60 inches

Map Unit Components	Lithic Xeropsamments	Rock outcrop
Approximate Proportion	50 percent	30 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges
Slope	40 to 65 percent	
Typical Vegetation Series	Greenleaf Manzanita/Jeffrey Pine	

Soil Profile Description

Surface Layer	0 to 11 inches; brown gravelly loamy coarse sand; single grain; loose; 15 percent pebbles; pH 5.6	Rock outcrop consists of massive exposures of granitic rock
Subsoil	11 inches; unweathered granodiorite	
Substratum	11 inches; unweathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	4" to 20"	
Drainage	Excessively drained	
Permeability	Rapid	
Available Water Capacity	0.3 to 1.5	
Upper 20 inches	0.3 to 1.5	
Total	0.3 to 1.5	
Hydrologic Soil Group	D	
Unified Soil Classification	SW-SM	
Erosion Factor K	.17	
Maximum Erosion Hazard	High and very high	
Sensitivity	High	
Soil Manageability Class	4EDX	
Annual Forage Production	Less than 200 lbs/acre	
Forest Survey Site Class	6 and 7	
Manageability Group	IV	
Included Areas and Remarks:	<p>Included in this unit are small areas of soils in the Cagwin family, soils similar to Lithic Xeropsamments but have more than 35 percent rock fragments and/or are on highly weathered bedrock, soils in the Sirretta family on colluvial slopes, and Entic Xerumbrepts in the Globe Rock area. Included areas make up about 20 percent of the map unit area. The artificial regeneration potential and plantability of this soil is very poor. Lithic Xeropsamments have a maximum erosion hazard of high on slopes of 40 to 50 percent and very high on slopes over 50 percent. Rock outcrop concentrates large quantities of water on downslope soils which increases the erosion hazard of those soils.</p>	

146 Neuns family, 25 to 60 percent slopes

Elevation: 3,800 to 6,400 feet Annual Precipitation: 35 to 50 inches

Map Unit Components	Neuns family
Approximate Proportion	60 percent
Landscape Position	Mountainsides, colluvial slopes, and ridges
Slope	25 to 60 percent
Typical Vegetation Series	Mixed Conifer-Fir, Ponderosa Pine, Mixed Conifer-Pine

Soil Profile Description

Surface Layer	0 to 7 inches; dark yellowish brown gravelly loam; weak granular structure; soft; 25 percent pebbles; pH 6.5
Subsoil	7 to 45 inches; reddish yellow cobbly loam; weak subangular blocky structure; slightly hard; 25 percent rock fragments; pH 5.5
Substratum	45 to 54 inches; brownish yellow extremely cobbly loam; massive; slightly hard; 75 percent rock fragments; pH 5.0
	54 inches; highly weathered and fractured metasedimentary rock

Soil Properties & Management Interpretations

Effective Rooting Depth	40 to 60 inches
Drainage	Well drained
Permeability	Moderately rapid
Available Water Capacity	
Upper 20 inches	2.3 to 2.7
Total	5.0 to 7.6
Hydrologic Soil Group	B
Unified Soil Classification	SM/SM/GM
Erosion Factor K	.24
Maximum Erosion Hazard	Moderate and high
Sensitivity	Low and moderate
Soil Manageability Class	3e
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	3
Manageability Group	III
Included Areas and Remarks:	Included in this unit are small areas of soils similar to the Neuns family but have stronger developed subsoils, deep colluvial soils with well developed subsoils on north-facing slopes in the Soquel Meadow area, soils formed in residual materials with clay loam subsoils in the Chowchilla Mountain, Nelder Grove, and Chipmunk/Poison Meadow areas, and soils that are cooler. Included areas make up about 40 percent of the map unit area. Road cutbanks are moderately unstable on north-facing slopes. Typically, the Mixed Conifer-Fir Vegetation Series occurs on north-facing slopes and Ponderosa Pine and Mixed Conifer-Pine Series occur on south-facing slopes. In some areas, soils in the Neuns family are difficult to plant due to high rock fragment content. The maximum erosion hazard of these soils is moderate on slopes of 25 to 35 percent and high on slopes over 35 percent. Sensitivity is low on slopes of 25 to 35 percent and moderate on slopes over 35 percent.

147 Rock outcrop

Elevation:

Annual Precipitation:

Map Unit Components

Rock outcrop

Approximate Proportion

90 percent

Landscape Position

Slope

Typical Vegetation Series

Soil Profile Description

Surface Layer

Rock outcrop consists of large areas of exposed bedrock, mainly granitic

Subsoil

Substratum

Soil Properties & Management Interpretations

Effective Rooting Depth

Drainage

Permeability

Available Water Capacity

Upper 20 inches

Total

Hydrologic Soil Group

Unified Soil Classification

Erosion Factor K

Maximum Erosion Hazard

Sensitivity

Soil Manageability Class

Annual Forage Production

Forest Survey Site Class

Manageability Group

Included Areas and
Remarks:

Included in this unit are small areas of soils that can support vegetation. These soil areas make up about 10 percent of the map unit area. Rock outcrop occurs at all elevations and is made up of all geologic rock types. Runoff from Rock outcrop is very high. Large quantities of water concentrate on downslope soils which increases the erosion hazard of these soils.

148 Rock outcrop - Chawanakee family association, 35 to 65 percent slopes

Elevation: 2,800 to 6,400 feet Annual Precipitation: 30 to 45 inches

Map Unit Components	Rock outcrop	Chawanakee family
Approximate Proportion	50 percent	35 percent
Landscape Position	Mountainsides and ridges	Mountainsides and ridges
Slope		35 to 65 percent
Typical Vegetation Series		Mariposa Manzanita

Soil Profile Description

Surface Layer	Rock outcrop consists of isolated outcroppings and massive exposures of granitic rock	0 to 4 inches; grayish brown coarse sandy loam; weak granular structure; slightly hard; pH 6.2
Subsoil		4 to 19 inches; very pale brown coarse sandy loam; weak subangular blocky structure; slightly hard; pH 5.8
Substratum		19 inches; greatly weathered granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	12 to 20 inches
Drainage	Somewhat excessively drained
Permeability	Moderately rapid
Available Water Capacity	
Upper 20 inches	0.9 to 2.0
Total	0.9 to 2.0
Hydrologic Soil Group	C
Unified Soil Classification	SM
Erosion Factor K	.20
Maximum Erosion Hazard	High and very high
Sensitivity	High
Soil Manageability Class	4EXd
Annual Forage Production	Less than 200 lbs/acre
Forest Survey Site Class	NC
Manageability Group	IV

Included Areas and Remarks: Included in this unit are small areas of soils similar to the Chawanakee family but are dark, sandy, have more than 35 percent rock fragments, or are on gentler or steeper slopes. Also included are soils in the Chaix family. Included areas make up about 15 percent of the map unit area. The maximum erosion hazard for Chawanakee family soils is high on slopes of 35 to 50 percent and very high on slopes over 50 percent.